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# Semi-analytical stochastic study of radionuclide transport in the saturated zone below Yucca Mountain

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# Semi-analytical Stochastic Study of Radionuclide Transport in the Saturated Zone Below Yucca Mountain

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# Executive Summary

The objective of this study is to predict radionuclide solute transport process in the saturated zone below the Yucca Mountain project area. Based on a stochastic perturbation approach, a numerical method of moments has been developed and used to predict the mean, variance and upper bound of the radionuclide mass flux through a control plane 5-km downstream of the footprint of the repository. This study enhances the analysis of the effect of medium's heterogeneity on solute transport prediction, especially on prediction uncertainty.

The study domain ranges from 547550 to 552550 in east coordinate, 4077200 to 4082700 in north coordinate, and from 100 m to 1000 m above mean sea level in vertically direction. The domain is a box with 5,500 m in north-south direction, 5,000 m in east-west direction and 900 m vertically. There are seven geological layers in the study domain. According to the regional groundwater study results, the groundwater flow is mainly in the north- south direction. This study is to simulate the radionuclide transport from the footprint of the repository (near the North boundary of the study domain) to a 5-km control plane (near the South boundary of this study domain). This study is a complementary to the numerical study conducted by Los Alamos National Laboratory (LANL) and Sandia National laboratory (SNL) on site-scale saturated zone flow and transport.

LANL applied a numerical method to conduct site-scale modeling of groundwater flow and radionuclide transport below the Yucca Mountain Project area (YMP) [*Zyvoloski et al*, 1997]. The study is based on a regional groundwater flow modeling effort conducted by the USGS [*Czarnecki et al*, 1997]. The site-scale groundwater flow model provides the hydrological framework for determining the direction and rate of movement of radionuclides in the saturated zone beneath Yucca Mountain. Their model for solute transport includes advection transport of radionuclides, dispersion, diffusion of radionuclides from fractures into the rock matrix, and sorption. Recently, LANL and SNL [*Zyvoloski et al*., 2002] have conducted a calibrated study to determine groundwater flow paths based with the hydraulic head and conductivity measurements. In these studies, multiple reactive nuclides and colloids are considered in conjunction with such processes as matrix diffusion in the deterministic model. In this study, we simplify the mechanistic processes, but enhance the analysis of the effect of medium heterogeneity, especially on the prediction uncertainty.

In the study domain, there are seven geological layers. The boundary positions of the layers are taken from the previous studies [*Zyvoloski et al*, 1997; *Czarnecki et al*, 1997]. We assume the conductivity field within each layer is statistically homogeneous (or stationary) and its distribution is satisfied by a log-normal function. However, the mean and variance of each layer are allowed to vary. The conductivity distribution in the study domain is nonstationary or zonally stationary. The software program, SuperPosV1.0, which is based on a standard geostatistical method, has been developed and has been assessed by the DOE quality assurance review process. The software was then used to study the conductivity distribution. The sorption coefficient, porosity and bulk density in each layer are assumed to be constant and their values are determined from the limited data set available. Since many chemicals exist in the radionuclide wastes, we grouped all migrating species into three categories reflecting their tendency to be retarded during transport. The weakly sorbing species include Uranium,

Neptunium, Nickel, Protactinium and Selenium, the strongly sorbing species include Americium, Plutonium and lead, and the non reactive species.

In this study, the method of moments for flow and transport in a two-dimensional non-stationary field [*Andricevic and Cvetkovic*, 1998; *Hu et al*., 1999; *Zhang et al*., 1999] has been extended to a three-dimensional field with nonstationarity in both hydraulic conductivity and sorption coefficient [*Hu et al*., 2002a,b; *Wu et al*., 2002a,b]. For this new method, the assumptions commonly used in many stochastic theory developments [e.g., *Dagan*, 1989; *Gelhar*, 1993], such as the constant mean velocity, stationary conductivity field, no-hydraulic boundary and simple initial plume distribution, do not constrain the simulations. Therefore, the developed method provides a tool to apply perturbation stochastic theory to study solute transport in complicated subsurface environments. Based on the theoretical development, a numerical code, NMM3D, has been developed and passed the Quality Assurance operated by DOE Yucca Mountain project office.

The code, NMM3D, was applied to calculate the transport behavior of the three classes of transported chemical species in the study domain. In the simulation, we assumed that the groundwater flow is steady-state. The north and south boundaries of the study domain are assumed to be constant head boundaries and head values at the boundaries are obtained from the regional groundwater study. The other boundaries are assumed to be no-flow boundaries. Three vertical locations of the initial plume (upper, middle and lower) were chosen. Based on these assumptions, we calculated the means and variances of the breakthrough curves for the three kinds of chemicals. Based on the calculation results of means and variances, we also provide the upper bounds of the solute flux. From the calculation results of nonreactive solute flux, the mean transport times from the three source locations are about 90 (upper), 50 (middle) and 200 (lower) years, respectively. With 95 percent of confidence, the solute travel time to the control plane will be greater than 75 years for the upper source case, 20 years for the middle source case, and 40 years for the lower source case. The calculation results for the weakly and strongly sorbing chemicals show that the transport times through the control plane are significantly delayed.

To verify the method of moments, a Monte Carlo simulation was conducted for the nonreactive chemical transport. The calculation results indicate that the two method results are consistent.

# CONTENTS

**Page**

Executive Summary…………………………………………………………………… 1

Contents……………………………………………………………………………..…3

Figures…………………………………………………………………………………5

Tables…………………………………………………………………………………7

1. Introduction…………………………………………………………………………8

2. Geology and Hydrogeology of the Research Area……………………………………9

3. Conductivity Generation of the Study Area……………………...………………………..13

4. Solute Flux Prediction By Numerical Method of Moments …….…………...………………22

4.1. Development of Numerical Method of Moments for Flow and Transport……………………………………………………………………………..23

4.1.1. Formulation of Solute Mass Flux Moments………………………………………23

4.1.2. Expressions for PDFs……………………………………………………………..27

4.1.3. Physical and Chemical Nonstationarity…………………………………………...28

4.1.4. Spatial Moments of Velocity Covariance…………………………………………30

4.1.5. Numerical Implementation………………………………………………………..34

4.1.6. Numerical Code Development……………………………………………………35

4.2. Study Results…………………………………………………………………………36

4.2.1. Model Assumptions……………………………………………………………….36

4.2.2. Calculation Results of Mean, Variance and Upper Bound of Solute Flux………38

5. Comparison of the Results by Method of Moments and Monte Carlo Simulation……………………….……………………………………………………..49

5.1. Generating the Realizations of Hydraulic Conductivity Field and Porosity Field…...…………………………………………………………………….49

5.2. Groundwater Flow and Solute Transport Simulations…………………………………….50

5.3. Simulation Results and Discussion…..………………………………………………….51

6. Summary……………………………………………………………………………56

7. References……………………………………………………………….…………………58

8. Appendix……………………………………………………………………………………62

Appendix A. The input data for NMM3D……………………………………………63

Appendix B. Prediction of mean, variance and upper bound of total solute flux for nonreactive solute with source location at upper layers…………………………97

Appendix C. Prediction of mean, variance and upper bound of total solute flux for weak-sorption solute with source location at upper layers……………………..102

Appendix D. Prediction of mean, variance and upper bound of total solute flux for strong-sorption solute with source location at upper layers…………………….107

Appendix E. Prediction of mean, variance and upper bound of total solute flux for nonreactive solute with source location at middle layers………………………112

Appendix F. Prediction of mean, variance and upper bound of total solute flux for weak-sorption solute with source location at middle layers…………………...117

Appendix G. Prediction of mean, variance and upper bound of total solute flux for strong-sorption solute with source location at middle layers…………………...122

Appendix H. Prediction of mean, variance and upper bound of total solute flux for nonreactive solute with source location at bottom layers………………………127

Appendix I. Prediction of mean, variance and upper bound of total solute flux for weak-sorption solute with source location at bottom layers…………………...132

Appendix J. Prediction of mean, variance and upper bound of total solute flux for strong-sorption solute with source location at bottom layers…………………..137

# FIGURES

**Page**

Figure 2-1. Study area location within saturated zone (SZ) model……...…..…………..………11

Figure 2-2. Hydrogeologic model of study area viewed from the northeast…...…..……...………12

Figure 3-1. Geometric heterogeneity with constant mean and variance……..………...…………14

Figure 3-2. Correlation ellipsoid…………………………………………………………………18

Figure 3-3. Discrete and Overlapping Distributions………..……………………………………….18

Figure 3-4 Composite attribute field flowchart……………………………………………….20

Figure 4-1a. Distributions of the layers in the study domain………………………………...37

Figure 4-1b Locations of the sources and control plane…………………………………………38

Figure 4.2. Solute flux breakthrough curves of the nonreactive chemical for the upper source : (a) mean, (b) variance and (c) upper bound………………………………………39

Figure 4.3. Solute flux breakthrough curves of the weak sorption chemical for the upper source : (a) mean, (b) variance and (c) upper bound………………………………………40

Figure 4.4. Solute flux breakthrough curves of the strong sorption chemical for the upper source : (a) mean, (b) variance and (c) upper bound………………………………………41

Figure 4.5. Solute flux breakthrough curves of the nonreactive chemical for the middle source : (a) mean, (b) variance and (c) upper bound………………………………………42

Figure 4.6. Solute flux breakthrough curves of the weak sorption chemical for the middle source: (a) mean, (b) variance and (c) upper bound……………………………………….43

Figure 4.7. Solute flux breakthrough curves of the strong sorption chemical for the middle source: (a) mean, (b) variance and (c) upper bound……………………………….44

Figure 4.8. Solute flux breakthrough curves of the nonreactive chemical for the lower source : (a) mean, (b) variance and (c) upper bound………………………………………45

Figure 4.9. Solute flux breakthrough curves of the weak sorption chemical for the lower source : (a) mean, (b) variance and (c) upper bound………………………………………46

Figure 4.10. Solute flux breakthrough curves of the strong sorption chemical for the middle source : (a) mean, (b) variance and (c) upper bound………………………………47

Figure 5-1. Generated ln*K* field and porosity field. (a) lnK; (b) porosity………………………..50

Figure 5-2. Illustration for travel time calculation through a cell………………..…………….50

Figure 5-3. Realizations of solute flux across the control plane…………………………………51

Figure 5-4. Monte Carlo simulated mean and variance of solute flux vs. realization numbers……………………………………………………………………………………52

Figure 5-5. Monte Carlo simulated mean solute flux and its 95% confidence bounds…..……...53

Figure 5-6. Comparison of results by Method of moments and Monte Carlo simulation for the nonreactive chemical with the upper source location………………………………..54

Figure 5-7. Comparison of results by method of moments and Monte Carlo simulation for the nonreactive chemical with the middle source location………………………………55

Figure 5-8. Comparison of results by method of moments and Monte Carlo simulation for the nonreactive chemical with the lower source location…………………………...…...56

# TABLES

**Page**

Table 2-1 Study area bounding coordinates (UTM meters and Meters above mean sea level)……10

Table 2-2 Hydrogeologic Unit names (Ascending order)……10

Table 2-3 SZ framework model layers found in study domain…….12

Table 3-1 Intrinsic permeability parameters……..21

Table 3-2 $K_d$ Estimates……..22

# 1. Introduction

The U.S. Nuclear Waste Technical Review Board [*Cohon et al*., 1998] evaluated the technical and scientific validity of activities undertaken by the Secretary of Energy to characterize Yucca Mountain in Nevada for its suitability as a location for a repository for high-level radioactive waste and spent nuclear fuel. In the report, the Board pointed out that the study on groundwater flow and radionuclide transport in the saturated zone below Yucca Mountain should focus on reducing the prediction uncertainty over the next several years. The saturated zone acts as a natural barrier by (1) delaying the arrival of radionuclides at the accessible environment and (2) reducing radionuclide concentrations in groundwater, and thus dose to a critical group, through dispersion and dilution. The saturated zone may have greater potential as a barrier than can be demonstrated by currently available data.

Los Alamos National Laboratories (LANL) applied a numerical method to conduct site-scale modeling of groundwater flow and radionuclide transport below the Yucca Mountain Project area (YMP) [*Zyvoloski et al.*, 1997]. The study is based on a regional groundwater flow modeling effort conducted by the United States Geological Survey (USGS) [*Czarnecki et al,* 1997]. The site-scale groundwater flow model provides the hydrological framework for determining the direction and rate of movement of radionuclides reaching the saturated zone beneath Yucca Mountain. In addition to flow issues, the migration of radionuclides to the accessible environment depends on transport processes and parameters distinct from the flow model itself. Their model for transport includes advection transport of radionuclides, dispersion, diffusion of radionuclides from fractures into the rock matrix, and sorption.

The radionuclide transport modeling effort is separated into two parts [*Zyvoloski et al.*, 1997]. To simulate radionuclide transport from the footprint of the repository to a 5-km compliance, a sub-sit- scale model developed at Sandia National Laboratories (SNL) [*Ho et al*., 1996] was used. This model was chosen as an appropriate substitute to performing these calculations using the site-scale model because of the more accurate representation of the geology near Yucca Mountain. When the site-scale model is revised to use the new hydrostratigraphic data based on a 250×250-m geologic grid, all calculations will be performed with the site-scale itself. The results of the sub-site-scale model are then used as input to transport calculations to a hypothetical 20-km compliance point in the site-scale model.

The complex heterogeneity of the natural media and the uncertainty in data for the saturated zone below the YMP preclude the use of traditional deterministic approaches to model solute transport. To overcome the scale dependence of hydraulic parameters, current deterministic numerical methods [*Zyvoloski et al*., 1997] adopt the concept of macro-parameters (or effective values of parameters), which comes from stochastic theory [e.g., *Gelhar and Axness*, 1983; *Dagan*, 1982, 1984], to deal with small scale variations of parameters. This adoption, coupled with the flexibility of numerical methods to complex initial and boundary conditions, makes the current numerical modeling approach popular in modeling groundwater flow and chemical transport processes. Small-scale variation of parameters, such as hydraulic conductivity, has significant influence on macro-scale flow and transport processes. SNL has conducted geostatistical studies to investigate parameter variation within a single gridblock (500×500×50 m). Dispersivity in the grid scale has been obtained. However, geostatistical simulations of the hydraulic conductivity and sorption coefficients at the scale of the site-scale model (30×45×0.9

km) have not been conducted. These geostatistical simulations are the basis for study of dispersion process and for the uncertainty analysis of radionuclide transport prediction at the site scale. Currently, a very important issue that needs to be addressed is how to scale-up the parameter values to effective macro-scale parameter values, especially the evaluation of macro-dispersivity from micro-scale variation of hydraulic conductivity.

The numerical method, coupled with effective parameter values, has been widely applied to predict mean or expectation values of flow and chemical plume distributions. However, much less efforts have been paid on the uncertainty of prediction, which is associated with the uncertainty of input data of parameters. The quantification of the prediction uncertainty is as important as the mean value prediction in the engineering design. Therefore, the uncertainty analysis, or possible variation about the expected concentration or solute flux, is another issue that needs to be studied.

In this project, a three-dimenisonal method of moments for groundwater flow and solute transport in a nonstationary conductivity field has been fully developed [*Hu et al*., 2002; *Hu and Wu*, 2002; *Wu et al*., 2002; *Wu and Hu*, 2002]. This method is based on the general framework for solute transport [*Andricevic and Cvetkovic*, 1998; *Zhang et al*., 2000], but a new method is developed to calculate the covariances of solute parcels. Based on the theoretical development, a numerical code, NMM3D, was developed for calculating the mean and variance of solute flux through a control domain downstream of a contaminant source. The developed method is then used to study radionuclide transport in saturated groundwater below Yucca Mountain. The study focus on the transport prediction uncertainty owing to the scarcity of available data. The study results will give the mean solute plume distribution (or solute flux through a control plane) and the upper and lower bounds of prediction error. The method in this study provides a natural complement to the complex site-scale, process-level transport numerical model. Whereas multiple reactive nuclides and colloids are considered in conjunction with such processes as matrix diffusion in the deterministic model, the stochastic approach simplifies the mechanistic processes but enhances the analysis of the effect of material heterogeneity. Together, the two approaches provide a framework for assessing uncertainty of a variety of mechanisms affecting performance assessment and design of monitoring observation systems.

The objective of this project is to apply a stochastic analysis method to study the influence of medium's heterogeneity on the prediction of solute transport process in the saturated zone below the YMP area. In section 2, the basic geologic and hydrogeologic conditions of this study area are brieftly introduced. A geostatistical method is applied to analyze the random distribution of conductivity in the study area in section 3. In section 4, a numerical method of moments is developed for solute transport in a nonstationary flow field with complex hydraulic boundary and solute initial conditions. The developed method is applied to predict nonreactive/reactive solute transport processes in the study area. In section 5, a Monte Carlo numerical study is used to check the method of moments. The study results are summaried in section 6.

## 2. Geology and Hydrogeology of the Research Area

The geology of the Yucca Mountain Project vicinity has been the subject of intense study for the last couple of decades. The research area falls within the Great Basin of the Basin and Range physiographic province. A section of Tertiary volcanics up to several kilometers in thickness has been block faulted into north-south oriented ridges. Localized alluvial deposits fill down-faulted basins. Underlying the alluvium and volcanics are carbonates and granites. Detailed descriptions of the geology can be found in the Yucca Mountain Site Characterization Project's Geologic Framework Model (GFM), Version 3.1 (DTN: M09901MWDGFM031.000) and in the references found therein. While disagreement remains regarding details in the various conceptual models, this study uses GFM version 3.1, the Hydrogeologic Framework Model for the site-scale saturated zone (SZ) flow model (described in ANL-NBS-HS-000033) to establish a geologic and hydrogeologic context.

The study area (2.75 x $10^7$ square meters) for this project is a rectangle bounded by the Universal Transverse Mercator (UTM) metric coordinates given in Table 2-1 and located in the north-central portion of the SZ model as shown in
Figure 2-1.

Table 2-1. Study area bounding coordinates (UTM meters and meters above mean sea level).

| | **East Coordinate** | **North Coordinate** | **Elevation** |
|---|---|---|---|
| **Minimum** | 547550 | 4077200 | 100 |
| **Maximum** | 552550 | 4082700 | 1,000 |

The domain for which intrinsic permeability was simulated is bounded on the top at 1,000 meters above mean sea level (AMSL) and at the base at 100 m AMSL.

A hydrogeologic framework model consisting of 19 units has been developed for SZ flow and transport modeling. The 19 units are listed in Table 2-2.

Table 2-2. Hydrogeologic unit names (ascending order).

| **Hydrogeologic Unit Name** | **Abbreviation** |
|---|---|
| Granites | Granites |
| Lower clastic confining unit | Lccu |
| Lower carbonate aquifer | Lca |
| Upper clastic confining unit (Eleana) | Uccu |
| Lower carbonate aquifer thrust | Icat2 |
| Upper carbonate aquifer | Uca |
| Undifferentiated valley fill | Leaky |
| Older volcanic confining unit | Lvcu |
| Older volcanic aquifer | Lva |
| Lower volcanic confining unit | Mvcu |
| Tram member of Crater Flat | Tct |
| Bullfrog member of Crater Flat | Tcb |
| Prow Pass member of Crater Flat | Tcp |
| Upper volcanic confining unit | Uvcu |
| Upper volcanic aquifer | Uva |
| Lava flows | Basalts |
| Cenozoic limestones | Amarls |
| Valley fill confining unit | Playas |
| Valley fill | Alluvium |

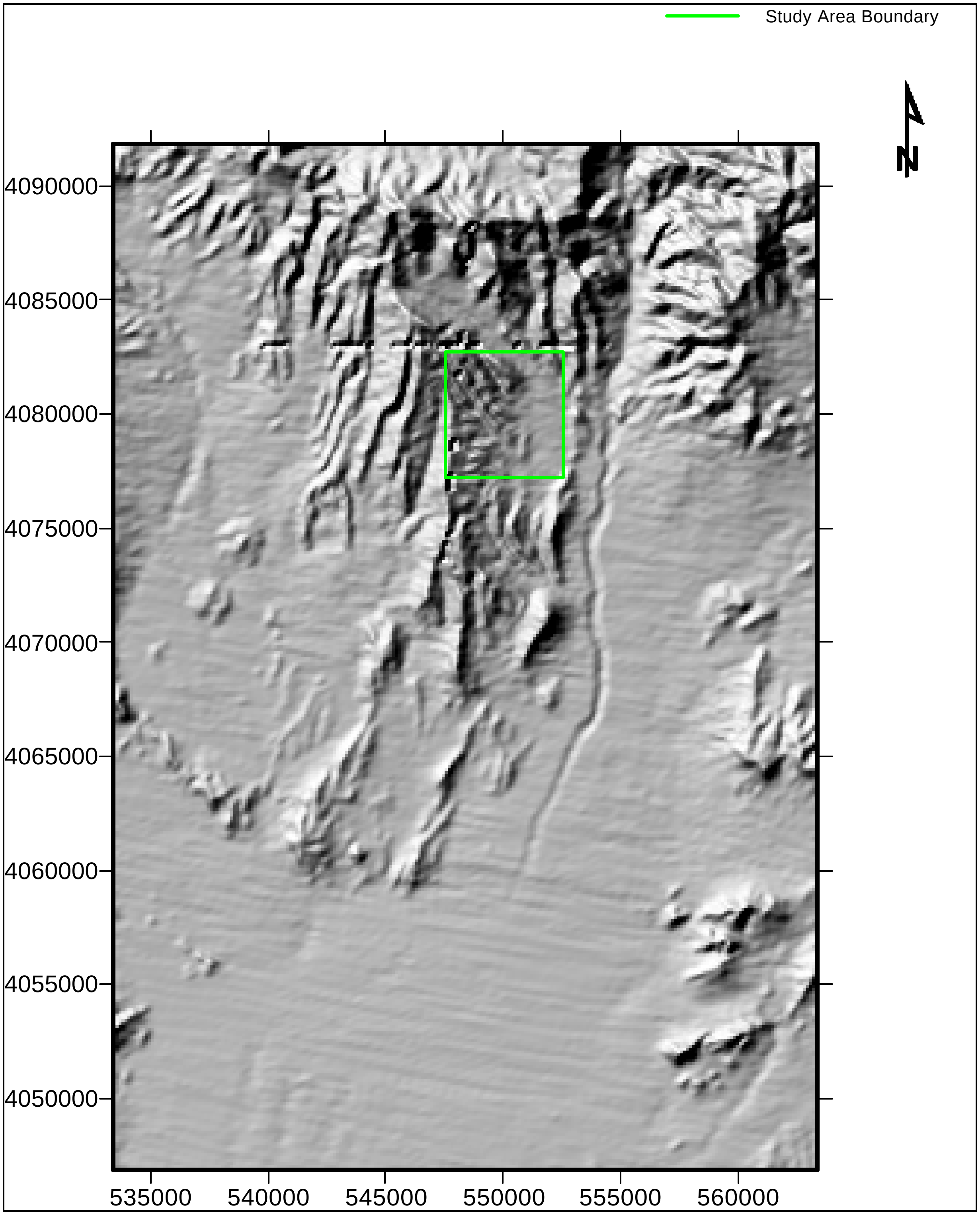



Figure 2-1 Study area location within saturated zone (SZ) model.

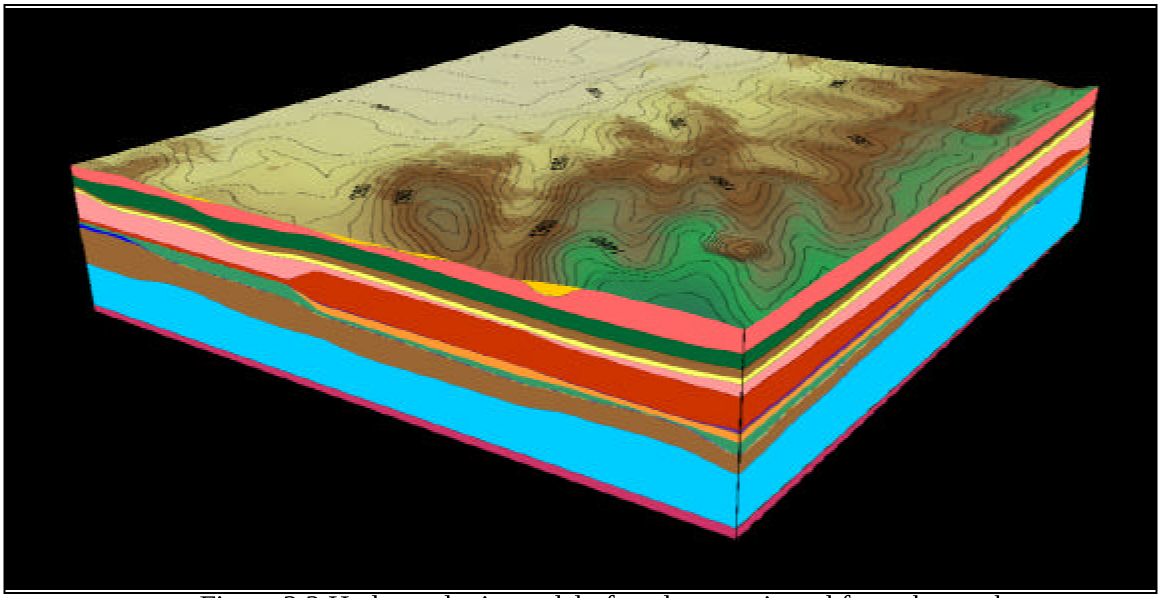


Figure 2-2 Hydrogeologic model of study area viewed from the northeast

The portion within horizontal bounds of the study area is shown in Figure 2-2. While this illustration shows all of the hydrogeolgic layers, the study domain is bounded vertically at 100 and 1000 m AMS. The specific layers from this model found in the study domain are listed in Table 2-3.

Table 2-3. SZ framework model layers found in study domain.

| Study Layer Number[1] | ID | Description | SZ Model Surface Number |
|---|---|---|---|
| **1** | alluvium | Valley Fill | **20** |
| **5** | uva | Upper Volcanic Aquifer | **16** |
| **6** | uvcu | Upper Volcanic Confining Unit | **15** |
| **7** | tcp | Prow Pass member of Crater Flat | **14** |
| **8** | tcb | Bullfrog member of Crater Flat | **13** |
| **9** | tct | Tram Member of Crater Flat | **12** |
| **10** | mvcu | Lower Volcanic Confining Unit | **11** |

The elevations of the tops of these framework units (supplied as non-QA'd grid files) were used to construct a three dimensional model. It was not possible to obtain elevations for these surfaces which had been quality approved for this study. As stated in ANL-NBS-000033, "The model consists of digital files in STRATAMODEL format (site125.tfm, site125.tfb, site125.scf, version 5-99).", which requires the proprietary software package STRATAMODEL to use. Acquistion and use of this expensive (approximately $40,000.00) and specialized software was outside of the scope of the project. It was anticapated that this data would become available in a useable format that was Quality Approved. Until quality approved ASCII versions of these surfaces becomes available, the quality approval of this portion of the study will remain unchanged. A supplimental project has been prepared at the request of LANL to apply this method to the entire saturated zone model area. If approved, QA'd versions of the surface elevations will be obtained

[1] Layers were numbered from the surface down in this study. In the SZ model, layers were numbered from the bottom up.

at that time. The discretized 3D deterministic model built from the surface elevation grids was used to control the simulation of intrinsic permeability within the study domain, the geological framework data were generated [UCCSN Data ID No: 025CS.001].

Decisions on how to subdivide a volume composed of heterogeneous geologic media and the associated subdivision of the hydraulic conductivity population are commonly based on sparse and incomplete information. The discipline of geology has evolved diverse methods for the categorization of geologic media with considerable emphasis on the lithic character of discrete units. The field of stratigraphy deals exclusively with this issue and consistent nomenclature has been proposed to address the delineation of hydrostratigraphic units. "A hydrostratigraphic unit is a body of rock distinguished and characterized by its porosity and permeability." (*Seaber*, 1992).

The critical relationship between field observable, mappable lithology based units and the distribution of hydraulic conductivity in any given location remains problematic. The mere fact that a lithostratigraphic unit may be distinguished does not mean that the hydraulic conductivity of that unit differs from other proximate lithostratigraphic units. Differences in flow and transport affecting attributes such as texture, lithology and alteration occur throughout a range of scales from near molecular to multiple kilometers.

Complete and exact knowledge of the spatial distribution of intrinsic permeability (known as hydraulic conductivity when the geologic medium is fully saturated with water of constant viscosity) remains unattainable in practical terms given the current state of measurement methods and analysis. Such exhaustive knowledge will in the absence of a radical advance in measurement technology, remain unattainable. Models of groundwater flow through heterogeneous geologic media will therefore be uncertain due to the uncertainty in this critical parameter.

## 3. Conductivity Generation of the Study Area

Heterogeneity of hydraulic conductivity and its influence on groundwater flow and solute transport are the focus of this study. Owing to the dramatic spatial variation of the conductivity and limited available data in the study area, a geostatistical method is applied to generate the spatially random distribution of the conductivity, and stochastic methods are applied to study the influence of the random distribution on flow and transport. Owing to the various geological layers that exist in the study area, the conductivity distribution within each layer is assumed to be statistically stationary and its distribution is described by a correlation function with several statistical parameters, such as mean, variance and correlation lengths of the log-conductivity. In this study, the available geological and hydrogeological data are analyzed to obtain the values of the parameters within each zone. Then based on a distributin function, the distributions of conductivity are generated in all of the study domain.

Heterogeneity occurs over a large range of scales, some readily observable, some suspected but poorly measured. The degree to which heterogeneity may be treated as a deterministic phenomenon is partially a function of scale. Phenomena causing large-scale variance are generally thought to be more easily observed.

Heterogeneity can be split, somewhat arbitrarily, but primarily based upon the nature and availability of observations, into two types, large-scale, relatively deterministic, and small-scale, relatively stochastic. Large-scale heterogeneity relies upon differentiating rock units based largely upon genetic processes and the resulting geometric shapes taken by these differing rock units. Genetic processes include the initial means of emplacing the rock, subsequent erosion and any displacements arising from tectonic events such as thrusting and faulting, i.e., any phenomena leading to current-day geometry. Figure 3-1 is a simple example of geometric heterogeneity where the mean and variance of an attribute is kept constant, but the configurations of the two units are varied. If the gray regions are considered high permeability and the white are considered low, it is apparent that flow behavior would be markedly different. Smaller-scale heterogeneity arises from variation in the processes of creating and altering the rock that operate within a single unit or a limited set of units. Intrinsic variation includes the range of processes of creating and altering the rock, and what type of fluid behavior moved the mineral mass into place. Differing processes result in different distribution of the voids in rock. This type of heterogeneity by definition occurs within a bounded region and is termed intrinsic heterogeneity. Intrinsic heterogeneity can be treated as a stochastic phenomenon with the implication that population within a bounded region is different in some significant fashion from populations found outside of the region. In the context of flow estimation, much of this significant difference can be captured in the population and spatial statistics of hydraulic conductivity.

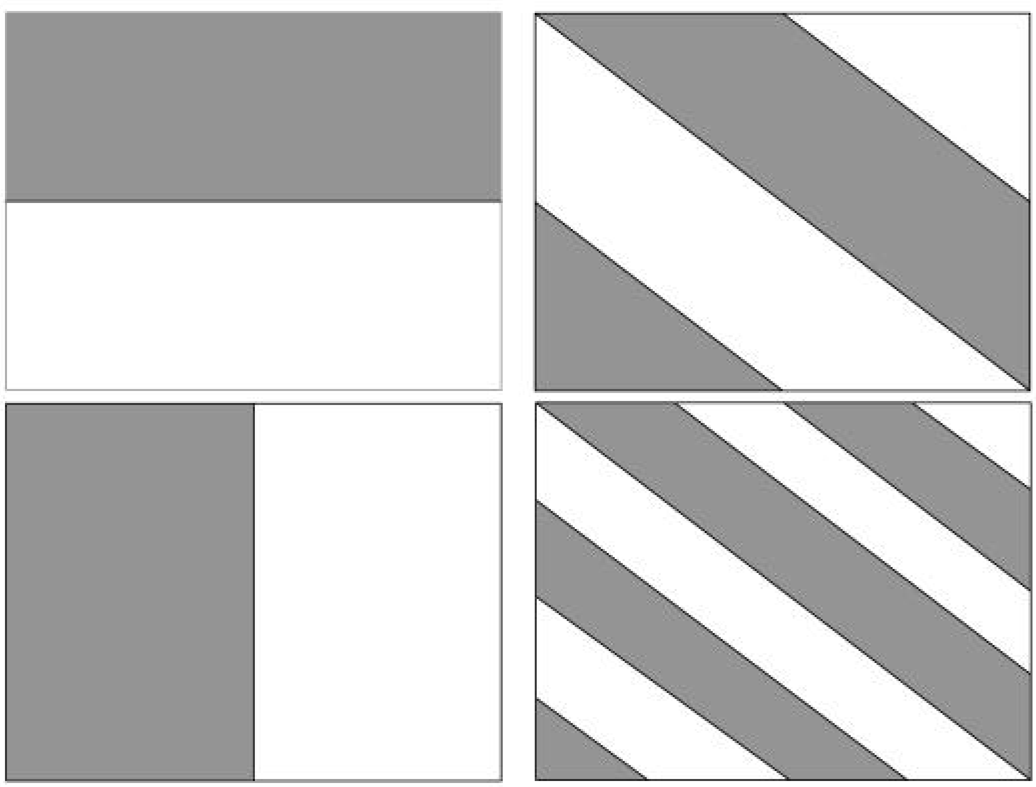


Figure 3-1. Geometric heterogeneity with constant mean and variance.

Rock classification schemes predicated upon genetic and alteration processes may serve as a useful basis upon which to estimate the distribution of hydraulic conductivity. Such observations of rock type are abundant, but imperfect predictors of hydraulic conductivity. The uncertainty not captured by subdividing on the basis of rock classification can be approximated by random simulation, "… random-function-based stochastic simulations tend to bypass the actual genetic process and rely on global statistics that are deemed representative of the end phenomenon actually observed." (*Deutsch and Journel*,1992).

Domains are often pragmatically subdivided based upon readily observable characteristics rather than known differences in the distribution of the attribute of interest. Either an assumption is made or sampling supports an inference that the attribute distribution is bounded within the sub-domains. The degree to which sub-domain attribute distributions overlap controls the extent to which sub-domains are distinct and thus contribute to the larger-scale, geometrically based heterogeneity.

Estimation of the spatial distribution of hydrologic attributes such as hydraulic conductivity can be done by repeatedly subdividing the domain of interest into less heterogeneous sub-domains. This process is repeated until the distribution within each sub-domain may be described to an acceptable level of accuracy. When the distribution of an attribute within a sub-domain is to be estimated as a continuous random field (RF), this process should be continued until the requirements of stationarity/homogeneity can be met. *Deutsch and Journal*, 1992, clearly identify the limitations of continuous random field simulation:

> *A continuous RF Model Z(**u**) cannot reproduce severe heterogeneities of discontinuities, as found when crossing a physical boundary such as that of a lithotype. If the phenomenon under study is a mixture of different physical and/or statistical populations, the geometry of the mixture should be modeled and simulated first; the attribute(s) within each homogeneous population can be simulated … A two-step approach to simulation is not only more consistent with the underlying physical phenomenon (e.g., geology); it also avoids stretching the stationarity / homogeneity requirement [The degree of spatial correlation of the attribute z(**u**) is usually quite different within a facies than across facies, unless there has been important diagenetic remobilization.] underlying most continuous RF models.*

In this study the two-step approach described above is repeatedly implemented with the assumption that the lithotypes comprising the geologic framework model have distinct population and spatial statistics and that there is no uncertainty in the location of contacts.

The classical estimator of the variogram, from Matheron [1962], cited by Cressie [1992] is

$$2\hat{g}(\mathbf{h}) \equiv \frac{1}{|N(\mathbf{h})|}\sum_{N(\mathbf{h})}\left(Z(\mathrm{s}_i) - Z(\mathrm{s}_j)\right)^2$$

where

$\mathrm{s}_i$ is a spatial location separated from location $\mathrm{s}_j$ by distance **h**,
*Z*(s) is a datum at location s, and
*N* is the number of data separated by distance **h**.

The data requirements for rigorous variogram estimation include the following:

1. Multiple samples
2. Correct spacing between samples
3. Support (sample scale) the same as model discretization
4. Samples are specific to a unit (population), not mixed
5. Sampling method is uniform and unbiased
6. Sample locations are in the model domain.

Economic, time and technical constraints cause the following conditions:

1. Too few samples
2. Incorrect or inadequate spacing of sample locations
3. Samples taken at various supports, not consistent with model discretization
4. Samples cover multiple units
5. Varying and biased sampling methods
6. Sample locations outside the model area.

It cannot be overstated that an adequate number of properly spaced, correctly scaled, unbiased samples is a requisite if these methods are to deliver the promised statistical rigor. When used with lesser quality data and more assumptions, the methods can provide useful models, but the rigor will be lost. In particular, the problem of support or measurement scale has been recognized as important.

> *There are a variety of mathematical methods for adjusting a distribution so that its variance will be reduced while its mean remains unchanged. Unfortunately, all of these depend on unverifiable assumptions about how the distribution changes as the support increases; they also require knowledge of certain parameters that are very difficult to estimate precisely.*
>
> *This problem of the discrepancy between the support of our samples and the intended support of our estimates is one of the most difficult we face in estimation (Isaaks and Srivastava, 1989)*

and have remained unresolved for at least a decade,

> *"From a statistical point of view, current solutions to the change-of-support problems are unsatisfactory; I believe that further progress will have to be model based"(Cressie, 1993).*

In this study, the following data limitations were noted: some layers have zero layer- specific samples, samples near model discretization size are generally not layer specific, many sampling methods have been used and these different methods may yield results that differ by two orders of magnitude at the same location.

Measures of intrinsic permeability range in scale from sub-core plugs to aquifer tests. The advantage of the smallest-scale tests is the certainty that only a specific lithology is being sampled. The drawback is that the sampling is biased toward the least permeable members of the distribution. The highest permeability in these materials may be where the material is strongly fractured. If the fracture is large enough, then a sub-core plug would be smaller than the fracture, and simply never be sampled. Thus, the very smallest, but most spatially and lithologically specific samples are from a biased population. The extent of this bias is unquantifiable. Borehole scale samples suffer from a similar, albeit less severe, bias. It is more difficult to recover intact fractured core for testing than it is to recover unfractured core. So again, the population is biased toward the lower end of the permeability distribution. Packer tests offer an improvement between specificity of lithology tested and a bias toward an unpracticed population. However, even these tests must be sited to avoid fractures at packer locations if a good seal is to be achieved. Additionally, this method is unable to accurately measure extremely low permeability. Thus, data from packer testing is often censored on both the upper and lower ends of the distribution. There is no way to determine if the censoring is symmetric; thus, the mean as well as the variance may be in error. If the packed intervals are large, then the likelihood of isolating a single lithologic class is diminished. Aquifer tests and tracer tests suffer from the problem of sampling a volume larger than the model discretization. Thus, the estimates of hydraulic conductivity are smoothed over several grid blocks. Additionally, the likelihood of sampling multiple lithologic classes increases with the volume sampled in the test. The horizontal correlation length is the most difficult parameter for which to develop an estimate. The horizontal spacing of boreholes constrains the lag distances available for use in developing a semivariogram. However, currently developing inverse methods of analyzing pumping and tracer test data hold great promise in generating appropriately scaled estimates of both population and spatial statistics.

Estimating the spatial distribution of any attribute in the absence of exhaustive sampling is always an exercise in division and aggregation, i.e., a set of decisions of what to lump together and what to split apart. Numerous authors (*Gomez-Hernandez et al*., 1997, *Capilla et al*., 1998), have demonstrated that the inclusion of of dynamic data such as transient pressure observations can dramatically improve the estimation of the spatial distribution transmissivity and hydraulic conductivity.  If the dynamic data are obtained from tests within the study area, then the estimate can be directly conditioned. If the data are not available from the study area, then the use of such analogues may be used to constrain the problem (keeping in mind use of analogues are always a source of unquantifiable uncertainties).

Virtually all modeling involves subdividing the spatial domain in some fashion. This process of subdivision raises the problem of scaling of attributes. If the entire domain is thought of as a single block, then it is obvious that the variance is zero and the correlation is infinite (relative to the domain). If the domain is subdivided into infinitesimal points, then the variance is at its maximum and the correlation length is at a minimum. At present, the change in variance and correlation length as a function of support-scale is unknown. It may be that each attribute, such as permeability, porosity and sorption, will have its own distinct relationship between support scale, variance and correlation length.

While such a subdivision holds the promise of reduced variability, it extracts a price in the form of increased sampling requirements. Each time a domain, or sub-domain is split, the number of parameters needed to describe the random fields doubles. Since estimation of these parameters requires multiple, appropriately sized and spaced observations of the attribute, the data requirements grow exponentially with each subdivision of the domain.

A relatively parsimonious description of a random field consists of a mean, variance, correlation lengths and orientation of the correlation anisotropy ellipsoid (see Figure 3-2). These five parameters required to simulate a 3dimensional attribute field are: mean ($\mu$), variance ($\sigma^2$), correlation lengths ($\lambda_x$, $\lambda_y$, $\lambda_z$), and orientation of correlation ellipsoid ($\alpha_1$, $\alpha_2$, $\alpha_3$).

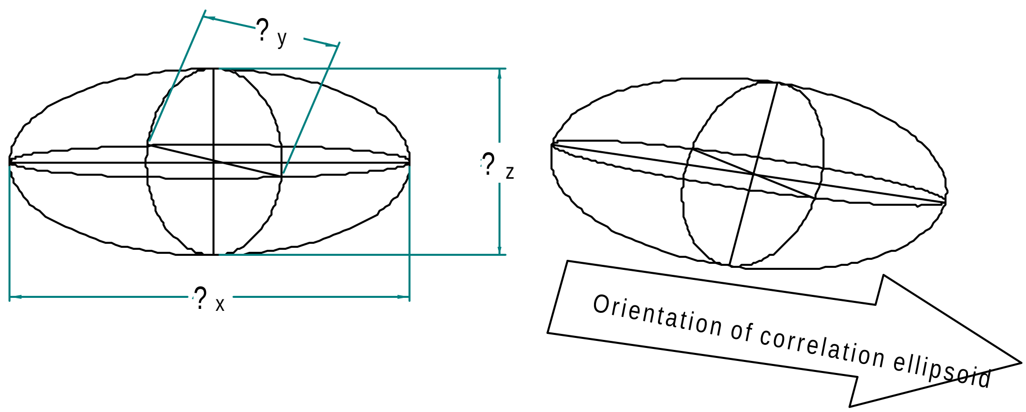
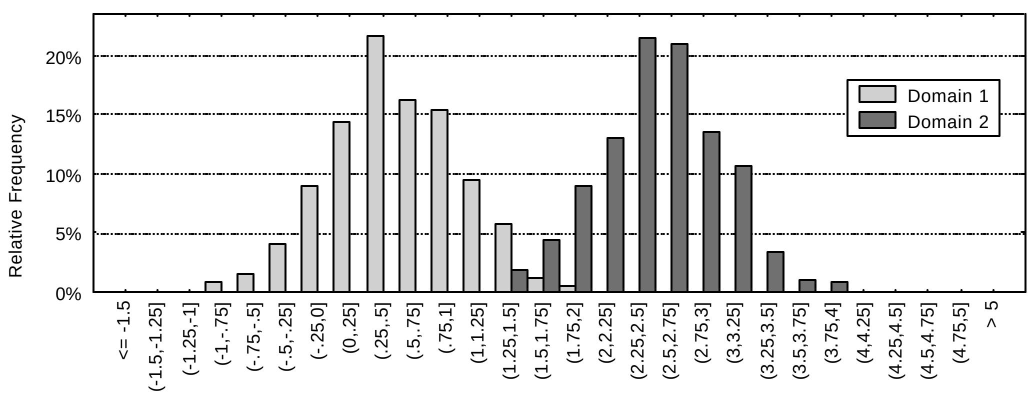



Figure 3-2. Correlation ellipsoid.



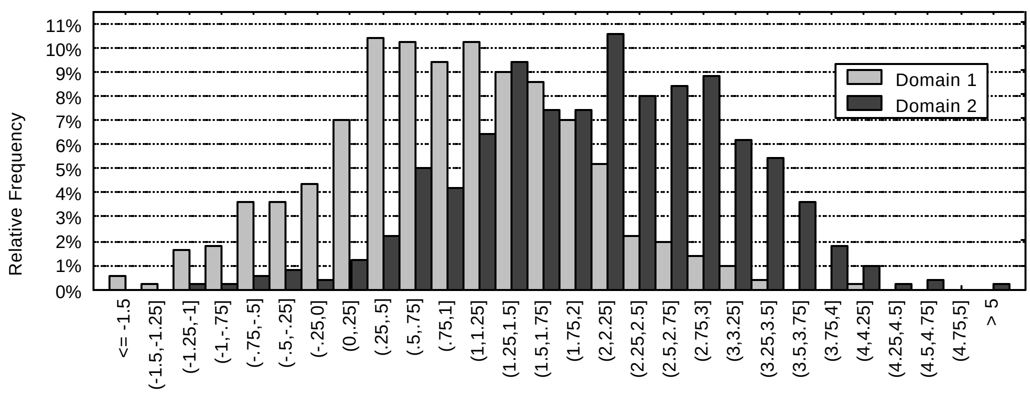




Figure 3-3. Discrete and Overlapping Distributions

In this study, a number of simplifying assumptions are made in modeling the distribution of intrinsic permeability. The SZ model units are treated as hard data. This means that contacts are considered as certain, i.e., there is no uncertainty in the vertical coordinate at any given horizontal point. Further, the units are considered as distinct and mutually exclusive, which means each unit is described by differing population and spatial statistics. In the context of considering intrinsic permeability as a set of random fields, each unit has a mean, variance, correlation lengths, and an anisotropy ellipsoid. Given the limited data, a simple exponential semivariogram model (*Cressie*, 1992), as follows, was used for all units.

$$g\left(\mathbf{h};\mathbf{\grave{e}}\right)=\begin{cases}0, & \mathbf{h}=\mathbf{0}\\ c_0+c_e\left\{1-\exp\left(-\left\|\mathbf{h}\right\|/a_e\right)\right\}, & \mathbf{h}\neq\mathbf{0},\end{cases}$$

$\mathbf{\grave{e}}=\left(c_0,c_e,a_e\right)'$, where $c_0\geq 0, c_e\geq 0,$ and $a_e\geq 0$

$c_0$ is the nugget effect

$c_e$ is the sill, and

$a_e$ is the range.

Within each model layer, attributes are treated as continuous random variables. Attribute variability within each layer is simulated as a spatially correlated random field. A composite attribute field is constructed by superpostioning the attribute value from the field corresponding to the layer at that location. At each element of the model, the layer is known. Random attribute fields of the same dimensions as the entire domain are generated for each class. The attribute value is chosen from the random field corresponding to the layer at that spatial location. The composite attribute field thus can demonstrate spatial structure due to the size, shape, abundance and juxtaposition of the layers, and the inherent variation within each layer. The composite attribute field reproduces the variability due to large scale, more deterministic spatial features such as faulting and bed pinch-out, as well as the smaller scale, more stochastic, and more sparsely sampled variability found within each layer.

Composite attribute fields such as permeability can be constructed in the four steps shown in Figure 3-4. These are:

1. Construction of the observable attribute model, in this case the layers of the SZ model.
2. Construction of zero mean, unit variance fields specific to each model layer with differing correlation lengths, anisotropy of correlation and orientation of the correlation ellipsoid. The spatial statistics unique to the model layer are produced at this stage.
3. Transformation of the zero mean, unit variance, spatially correlated fields to fields reproducing the specified distribution, i.e., means, variances and the previously specified spatial structure. If the data is available, a detailed culmulative density function can be used to generate a distribution not readily modeled by a limited parameter distribution. In almost every case, the tails of the distribution will have to be truncated to prevent the creation of physically implausible nodes.
4. Construction of a composite attribute field by superpositioning attribute values from the various layer-specific fields according to the layer designation at each grid location.

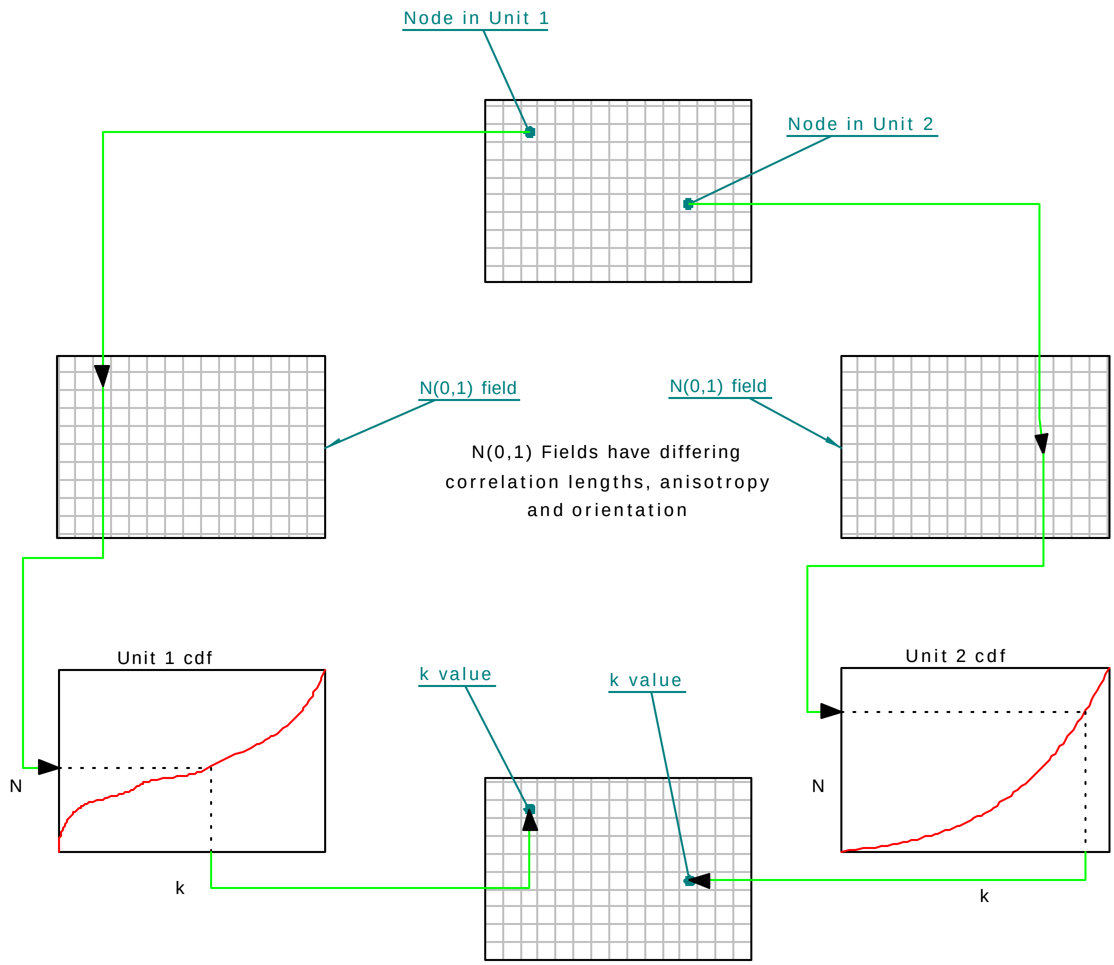



Figure 3-4. Composite attribute field flowchart.

Composite fields were generated using this method as implemented in the software program SuperPos V1.0 [SMR Documents Identification Number: 10585-SMR-1-00]. The zero mean, unit variance fields were produced using the sGsim program and transformed using the Backtran program both from the GSLIB package [Software Tracking Number: 10459]. The attribute model was comprised of the non-QA'd surfaces from an initial, non-QA'd version of the hydrogeologic framework model for the saturated zone site-scale flow and transport model.

The most serious weakness of the zoned composite geostatistical method is the need for correctly sized and located sampling. This is particularly acute for the estimation of correlation lengths. Intrinsic permeability is a parameter acutely sensitive to the rescaling required by diverse testing methods. Analysis of dynamic data, such as aquifer and tracer testing, appears to be a promising means to improve estimation of this critical parameter.

In this study, intrinsic permeability parameters were chosen to be as comparable as possible with the calibrated SZ base-case model given the differences in methodology. Since the intent of this study was to demonstrate the utility of the semi-analytical stochastic numerical method, rather than creating an independent estimate of these parameters, values considered consistent with the calibrated base case were used (Table 3-1). The cautions and limitations mentioned previously in this study remain as considerations. The anisotropy of correlation lengths was set to reproduce the anisotropy specified in the calibrated base case (DTN:LA0004AW12213S.001). The correlation lengths were set at what was considered the upper bound for the discretization used.

Table 3-1. Intrinsic permeability parameters

| Layer | Unit Name | Mean | Std Dev | Variance | $\lambda_x$ | $\lambda_y$ | $\lambda_z$ | Anisotropy | Porosity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Valley Fill Aquifer | 3.614 | 1.247 | 1.555 | 25 | 25 | 25 | 1 | 0.175 |
| 5 | Upper Volcanic Aquifer | -0.521 | 1.175 | 1.380 | 1000 | 1000 | 100 | 10 | 0.160 |
| 6 | Upper Volcanic Confining Unit | -0.991 | 0.380 | 0.144 | 75 | 75 | 75 | 1 | 0.330 |
| 7 | Crater Flat-Prow Pass | 4.084 | 0.639 | 0.408 | 1000 | 1000 | 100 | 10 | 0.280 |
| 8 | Crater Flat-Bullfrog | 4.739 | 0.573 | 0.329 | 1500 | 1500 | 150 | 10 | 0.180 |
| 9 | Crater Flat-Tram | 0.561 | 0.465 | 0.216 | 1000 | 1000 | 100 | 10 | 0.220 |
| 10 | Lower Volcanic Confining Unit | -4.210 | 1.620 | 2.625 | 750 | 750 | 75 | 10 | 0.155 |

Transportion estimates require calculation of the retardation of the solute front by means of the following equation.

$$\text{Retardation Factor} = 1 + (P_b / q)(K_d)$$

where $P_b$ is the bulk density,

$q$ is the porosity, and,

$K_d$ is the distribution coefficient.

Estimates of $K_d$ specific to layers were developed from published sources. Existing estimates are specific to three rock types, vitric tuff, devitrified tuff and zeolitic tuff. Estimates of $K_d$ exist for these rock types for various elements such as americium, plutonium, uranium, neptunium, radium, cesium, strontium, nickel, lead, tin, protactinium, and selenium. The tracer tests at the C-well complex, located within the bounds of the Yucca Mountain Project, yielded field-scale estimates of $K_d$ for Lithium. Rather than simulate transport for each element, weakly sorbing (typifying the range of sorbtion coefficients for elements such as Uranium, Neptunium, Nickel, Protactinium, and Selenium) and strongly sorbing generic elements (typifying the range of sorbtion coefficients found for Americium, Plutonium, and Lead) were used to provide bounding values for this study. $K_d$ values in the various layers for the weak and strong cases are shown in Table 3-2.

Table 3-2 $K_d$ estimates

| layer | Description | $K_d$ Weakly Sorbing | $K_d$ Strongly Sorbing | r b Bulk Density |
|---|---|---|---|---|
| 1 | Valley Fill Aquifer | 18 | 982 | 1.77 |
| 5 | Upper Volcanic Aquifer | 0.65 | 334 | 2.44 |
| 6 | Upper Volcanic Confining Unit | 0.85 | 423 | 2.08 |
| 7 | Crater Flat-Prow Pass | 0.75 | 1497.06 | 1.77 |
| 8 | Crater Flat-Bullfrog | 0.5 | 478.49 | 1.84 |
| 9 | Crater Flat-Tram | 0.5 | 412.5 | 1.94 |
| 10 | Lower Volcanic Confining Unit | 1 | 480 | 1.94 |

# 4. Solute Flux Prediction by Numerical Method of Moments

A useful representation of transport in aquifers is by the solute flux, defined as mass of solute per unit time and unit area. The solute flux is related to the flux-averaged concentration by dividing the former by the groundwater flux (e.g., *Kreft and Zuber*, 1978; *Dagan et al.*, 1992; *Andricevic and Cvetkovic*, 1998). The flux-averaged concentration is consistent with common procedures for measuring concentrations in laboratory columns, in soils, as well as aquifers (e.g., *Kreft and Zuber*, 1978). The solute discharge defined as the flux integrated over a control surface was considered as a prime quantity of interest in a number of studies (e.g., *Dagan and Nguyen*, 1989; *Cvetkovic et al*.,1992; *Andricevic and Cvetkovic*, 1998; *Selroos*, 1997a,b; *Zyvoloski et al*., 1997, 2002). Current regulatory standards for the subsurface environment, especially those set in terms of travel time like the YMP project, make the solute flux approach an appealing framework for predicting subsurface contaminant transport. For most applications, the mean description of transport (in the form of concentration or mass flux) is insufficient. The requirement is a statistical description of the concentration, or the mass flux, as a function of space and time such that both trends and fluctuations are quantified. For all practical purposes, this implies quantifying the first two moments (mean and variance) and assuming a distribution that can be used say in risk and safety assessment (*Andricevic*, 1996).

In this study, the solute mass flux method is applied to study radionuclide transport in the saturated zone below the YMP area. Most theories of solute flux are developed for solute transport in a stationary conductivity field. In this study, based on the general framework of solute flux (*Dagan et al*., 1992; *Andricevic and Cvetkovic*, 1998), a new theory for solute flux in nonstationary conductivity and sorption coefficient fields is developed. Based on the development of the theory, a new numerical code, NMM3D, has been developed for predicting the mean and variance of solute flux through a control plane downstream of a contaminant source. According to the statistical study on hydraulic conductivity, the code was then applied to study the possible solute transport in the saturated zone below the YMP area.

## 4.1. Development of Numerical Method of Moments Theory for Flow and Transport

In this subsection, we will apply a stochastic perturbation method to develop the nonstationary transport theory for solute transport in a nonstationary conductivity field with complicated boundary conditions. In this theory, the stochastic perturbation scheme is applied to set up the governing equations for solute flux mean and variance, and numerical approaches are implemented to solve the equations. The method can be used to study solute transport in nonstationary velocity field with complex initial and boundary conditions.

A three-dimensional numerical method of moments has been developed for solute flux through nonstationary flows in porous media. The solute flux is described as a space-time process where time refers to the solute flux breakthrough and space refers to the transverse displacement distribution at the control plane. The nonstationarity of velocity field may stem from the nonstationary conductivity distribution, such as the layering, and trend variation of the mean conductivity, or from boundary conditions. These nonstationarities are beyond the research scope of the traditional stochastic theory for stationary flow fields [*Gelhar and Axness*, 1983; *Dagan*, 1982, 1984], but widely exist in natural media. The first two statistics of solute flux are derived using the Lagrangian framework and are expressed in terms of the probability density functions (PDFs). These PDFs are given in terms of the one- and two-parcel moments of travel time and transverse locations, and these moments are related to the Eulerian velocity moments. The analytically set up frames for flow and transport are so complex that a numerical finite difference method is implemented to obtain their solutions.

### 4.1.1. Formulation of Solute Mass Flux Moments

An incompressible groundwater flow in a heterogeneous aquifer with spatially variable hydraulic conductivity $K(\mathbf{x})$ is considered, where $\mathbf{x}(x, y, z)$ is a Cartesian coordinate vector. Groundwater seepage velocity, $\mathbf{V}(\mathbf{x})$, satisfies the continuity equation, $\nabla \cdot (n\mathbf{V}) = 0$, and Darcy's law, $\mathbf{V} = -(K/n)\nabla h$, where $n$ is the effective porosity, and $h$ is the hydraulic head. The $\mathbf{V}(\mathbf{x})$ is considered to be nonstationary caused by the medium nonstationarity and/or limited boundaries of the domain. A solute of total mass $M$ is released into the flow field at time $t = 0$, over the injection area $A_0$ located at $x = 0$, either instantaneously or with a known release rate quantified by a rate function, $f(t)$ $[T^{-1}]$. We denote with $r_0(a)$ $[M/L^2]$ an areal density of injected solute mass at the location $\mathbf{a} \in A_0$. With $\Delta\mathbf{a}$ denoting an elementary area at $\mathbf{a}$, the parcel of mass $r_0 \Delta\mathbf{a}$ is advected by the random, spatially nonstationary groundwater velocity field $\mathbf{V}$. For $t > 0$, a solute plume is formed and advected downstream by the flow field toward a (y, z) plane, located at some distance from the source, through which the solute mass flux is to be predicted or measured. The plane is referred to as the control plane (CP). For non-reactive solute, the total solute mass flux over the entire CP at $x$ is

$$Q(t,x) = \int_{A_0} \int_{CP} r_0(\mathbf{a}) f(t-t) d(\mathbf{y}-\text{ç})\, d\,\mathbf{a}\, d\mathbf{y} \qquad (4\text{-}1)$$

Its mean and variance are given as [*Zhang et al*., 2000],

$$< Q(t,x) >= \int_{A_0}\int_0^{\infty} r_0(\mathbf{a}) f(t-\boldsymbol{t}) f_1[\boldsymbol{t}(x,\mathbf{a})] d\,\mathbf{a} \qquad (4\text{-}2)$$

$$\boldsymbol{s}_Q^2(t,x) =< Q^2 > - < Q >^2 \qquad (4\text{-}3)$$

with

$$< Q^2(t,x) >= \int_{A_0}\int_{A_0} r_0(\mathbf{a}) r_0(\mathbf{b}) f(t-\boldsymbol{t}_1) f(t-\boldsymbol{t}_2) f_2[\boldsymbol{t}_1(x,\mathbf{a}) = t; \boldsymbol{t}_2(x,\mathbf{b}) = t] d\,\mathbf{a}\, d\mathbf{b} \qquad (4\text{-}4)$$

where $\mathbf{x} \equiv (x,\mathbf{y}),\ \mathbf{y} \equiv (y,z),\ \boldsymbol{t} \equiv \boldsymbol{t}(x;\mathbf{a})$ is the travel time of the advective parcel from **a** to the CP at $x$, $f_1[\boldsymbol{t}(x,\mathbf{a})]$ is the marginal PDF of $f_1[\boldsymbol{t}(x,\mathbf{a}), \boldsymbol{ç}(x,\mathbf{a})]$, and $f_2[\boldsymbol{t}_1(x,\mathbf{a}); \boldsymbol{t}_2(x,\mathbf{b})]$ is the marginal PDF of $f_2[\boldsymbol{t}_1(x,\mathbf{a}), \boldsymbol{ç}_1(x,\mathbf{a}); \boldsymbol{t}_2(x,\mathbf{b}), \boldsymbol{ç}_2(x,\mathbf{b})]$. $f_1[\boldsymbol{t}(x,\mathbf{a}), \boldsymbol{ç}(x,\mathbf{a})]$ denotes the joint PDF of travel time $\boldsymbol{t}$ for a parcel from **a** to reach $x$ and the corresponding transverse displacement **h**, $f_2[\boldsymbol{t}_1(x,a), \boldsymbol{ç}_1(x,\mathbf{a}); \boldsymbol{t}_2(x,b), \boldsymbol{ç}_2(x,\mathbf{b})]$ is the two-parcel joint PDF of travel time and transverse displacement, and $\boldsymbol{ç} \equiv (\boldsymbol{h},\boldsymbol{x})$, ($\boldsymbol{h} \equiv \boldsymbol{h}(x;\mathbf{a})$ and $\boldsymbol{x} \equiv \boldsymbol{x}(x;\mathbf{a})$) are the transverse locations of a parcel passing through the CP. The $\boldsymbol{t}$ and $\boldsymbol{h}$ are random variables and are functions of the underlying random velocity field

To evaluate the statistical moments of the total solute flux, one needs to know the one- and two-parcel PDFs $f_1$ and $f_2$, or an infinite number of statistical moments. The approach used in this study is to evaluate a finite number of statistical moments and assume certain functions for $f_1$ and $f_2$. It has been found not unreasonable to approximate travel time, $\boldsymbol{t}$, with a lognormal distribution and transverse displacement, $\boldsymbol{h}$, as a normal distribution [*Bellin et al*., 1994; *Cvetkovic et al*., 1996]. Based on this assumption, the PDFs can be evaluated from the first two moments of $\boldsymbol{t}(x;\mathbf{a})$ and $\boldsymbol{ç}(x;\mathbf{a})$ as well as their joint moments.

With the relationships between $\boldsymbol{t}(x;\mathbf{a})$ and Lagrangian velocity and between Lagrangian and Eulerian velocities, the mean and covariance of $\boldsymbol{t}(x;\mathbf{a})$ in the first-order accuracy of $\boldsymbol{s}_y^2$, the variance of log-conductivity, are related to the Eulerian velocity as

$$< \boldsymbol{t}(L;\mathbf{a}) >= \int_{a_x}^{L} \frac{dx}{U_1(x, < \boldsymbol{h} >, < \boldsymbol{x} >)} \qquad (4\text{-}5)$$

and

$$\boldsymbol{s}_{t_1 t_2}(L;\mathbf{a};L;\mathbf{b}) = \int_{a_x}^{L}\int_{b_x}^{L} \frac{dx_1 dx_2}{U_1^2(x_1, < \boldsymbol{h}_1 >, < \boldsymbol{x}_1 >) U_1^2(x_2, < \boldsymbol{h}_2 >, < \boldsymbol{x}_2 >)}$$

$$\times [< u_1(x_1, < \boldsymbol{h}_1 >, < \boldsymbol{x}_1 >) u_1(x_2, < \boldsymbol{h}_2 >, < \boldsymbol{x}_2 >) >$$

$$+ g_1(x_1,<\boldsymbol{h}_1>,<\boldsymbol{x}_1>)g_1(x_2,<\boldsymbol{h}_2>,<\boldsymbol{x}_2>)<\boldsymbol{h}_1'\boldsymbol{h}_2'>$$

$$+ g_2(x_1,<\boldsymbol{h}_1>,<\boldsymbol{x}_1>)g_2(x_2,<\boldsymbol{h}_2>,<\boldsymbol{x}_2>)<\boldsymbol{x}_1'\boldsymbol{x}_2'>$$

$$+ 2g_1(x_2,<\boldsymbol{h}_2>,<\boldsymbol{x}_2>)<u_1(x_1,<\boldsymbol{h}_1>,<\boldsymbol{x}_1>)\boldsymbol{h}_2'>$$

$$+ 2g_2(x_2,<\boldsymbol{h}_2>,<\boldsymbol{x}_2>)<u_1(x_1,<\boldsymbol{h}_1>,<\boldsymbol{x}_1>)\boldsymbol{x}_2'>$$

$$+ 2g_1(x_1,<\boldsymbol{h}_1>,<\boldsymbol{x}_1>)g_2(x_2,<\boldsymbol{h}_2>,<\boldsymbol{x}_2>)<\boldsymbol{h}_1'\boldsymbol{x}_2'>] \quad (4\text{-}6)$$

where $\boldsymbol{h}'=\boldsymbol{h}-<\boldsymbol{h}>$, $\boldsymbol{x}'=\boldsymbol{x}-<\boldsymbol{x}>$ with $<\boldsymbol{h}'>=0$ and $<\boldsymbol{x}'>=0$, $\boldsymbol{h}_1=\boldsymbol{h}(x_1;\mathbf{a})$ and $\boldsymbol{h}_2=\boldsymbol{h}(x_2;\mathbf{a})$, $U_i$ and $u_i\,(i=1,2,3)$ are the mean and perturbation of Eulerian velocity, $g_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)=\left.\frac{\partial[U_1(x,\boldsymbol{h},\boldsymbol{x})]}{\partial\boldsymbol{h}}\right|_{\substack{h=<h>\\ x=<x>}}$ and $g_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>)=\left.\frac{\partial[U_1(x,\boldsymbol{h},\boldsymbol{x})]}{\partial\boldsymbol{x}}\right|_{\substack{h=<h>\\ x=<x>}}$. These expressions are derived up to the first order and therefore require the coefficient of variation of velocity to be (formally, much) smaller than 1. This condition may be satisfied for many practical

l subsurface flows where the variance of log-transformed hydraulic conductivity is moderately large. By setting **b** = **a**, one can obtain the variance of the travel time, $\boldsymbol{s}_t^2(L;\mathbf{a})$.

The statistical moments of $\boldsymbol{h}$ and $\boldsymbol{x}$ to the first order of $\boldsymbol{s}_{u_i}^2$, velocity variance, are obtained as

$$\frac{d<\boldsymbol{h}(x;\mathbf{a})>}{dx}=\frac{U_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)} \quad (4\text{-}7)$$

$$\frac{d<\boldsymbol{x}(x;\mathbf{a})>}{dx}=\frac{U_3(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)} \quad (4\text{-}8)$$

$$\frac{dh'(x;\mathbf{a})}{dx}=A_1(x,<h>,<x>)u_1(x,<h>,<x>)+B(x,<h>,<x>)u_2(x,<h>,<x>)$$

$$+C_1(x,<h>,<x>)h'(x;\mathbf{a})+D_1(x,<h>,<x>)x'(x;\mathbf{a}) \quad (4\text{-}9)$$

and

$$\frac{dx'(x;\mathbf{a})}{dx}=A_2(x,<h>,<x>)u_1(x,<h>,<x>)+B(x,<h>,<x>)u_3(x,<h>,<x>)$$

$$+C_2(x,<h>,<x>)h'(x;\mathbf{a})+D_2(x,<h>,<x>)x'(x;\mathbf{a}) \quad (4\text{-}10)$$

where

$$A_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = -\frac{U_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1^{\,2}(x,<\boldsymbol{h}>,<\boldsymbol{x}>)} \tag{4-11}$$

$$A_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = -\frac{U_3(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1^{\,2}(x,<\boldsymbol{h}>,<\boldsymbol{x}>)} \tag{4-12}$$

$$B(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = \frac{1}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)} \tag{4-13}$$

$$C_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = \frac{\partial U_2(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{h}}\Big|_{h=<h>} - \frac{U_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}\frac{\partial U_1(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{h}}\Big|_{h=<h>} \tag{4-14}$$

$$C_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = \frac{\partial U_3(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{h}}\Big|_{h=<h>} - \frac{U_3(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}\frac{\partial U_1(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{h}}\Big|_{h=<h>} \tag{4-15}$$

$$D_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = \frac{\partial U_2(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{x}}\Big|_{x=<x>} - \frac{U_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}\frac{\partial U_1(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{x}}\Big|_{x=<x>} \tag{4-16}$$

$$D_2(x,<\boldsymbol{h}>,<\boldsymbol{x}>) = \frac{\partial U_3(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{x}}\Big|_{x=<x>} - \frac{U_3(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}{U_1(x,<\boldsymbol{h}>,<\boldsymbol{x}>)}\frac{\partial U_1(x,\boldsymbol{h},\boldsymbol{x})}{\partial \boldsymbol{x}}\Big|_{x=<x>} \tag{4-17}$$

*Zhang et al*. [2000] used the integral form to obtain the integral expression for $\boldsymbol{h}$' in a two-dimensional case, $\boldsymbol{h}'(L;a) = \frac{1}{U_1(L,<\boldsymbol{h}>)}\int_{a_x}^{L}[u_2(x,<\boldsymbol{h}>) - \frac{U_2(x,<\boldsymbol{h}>)}{U_1(x,<\boldsymbol{h}>)}\times u_1(x,<\boldsymbol{h}>)]dx$, where the $\boldsymbol{h}$' is explicitly expressed by the means and perturbations of the velocities. However, for the three-dimensional case, it is very difficult, if not impossible, to obtain this kind of expression for $\boldsymbol{h}'$ and $\boldsymbol{x}'$. Therefore, differential equation forms are used to obtain the expressions of the various correlation functions related to $\boldsymbol{h}'$ and $\boldsymbol{x}'$.

Multiplying (4-9) by $h'(x_2;\mathbf{b})$, we obtain

$$\frac{d<h'(x_1;\mathbf{a})h'(x_2;\mathbf{b})>}{dx_1} = A_1(x_1,<h_1>,<x_1>)<u_1(x_1,<h_1>,<x_1>)h'(x_2;\mathbf{b})>$$

$$+B_1(x_1,<h_1>,<x_1>)<u_2(x_1,<h_1>,<x_1>)h'(x_2;\mathbf{b})> + C_1(x_1,<h_1>,<x_1>)<h'(x_1;\mathbf{a})h'(x_2;\mathbf{b})>$$

$$+D_1(x_1,<h_1>,<x_1>)<x'(x_1;\mathbf{a})h'(x_2;\mathbf{b})> \tag{4-18}$$

In a similar approach, the expressions of $<\boldsymbol{h}'\boldsymbol{x}'>$, $<\boldsymbol{x}'\boldsymbol{x}'>$, $<u_1\boldsymbol{h}'>$, $<u_1\boldsymbol{x}'>$, $<u_2\boldsymbol{h}'>$, $<u_2\boldsymbol{x}'>$, $<u_3\boldsymbol{h}'>$ and $<u_3\boldsymbol{x}'>$ are also obtained. For the purpose of brevity, their expressions are not given in this document. If readers are interested in the derivations of these expressions, please contact the authors. Since the differential equation forms are also suitable for the two-dimensional case, we conclude that the method developed in this study generalizes the two-dimensional case study [*Zhang et al*., 2000]. The velocity correlations, $<u_i u_j>$ $(i=1,2,3;\ j=1,2,3)$, can be obtained from the flow equations and are treated as known quantities or input data here.

From Equations (4-5) to (4-18) as well as the expressions of other correlation functions, it should be pointed out that the mean velocity is no longer required to be constant and the various covariance functions are no longer required to be stationary. The relaxation to the basic assumptions for the traditional stochastic theories [*Gelhar and Axness*, 1983; *Dagan* , 1982, 1984] makes this method applicable to predicting solute transport in complex subsurface media with various internal and external boundary conditions. On the other hand, the equations are so complicated that they are hardly solved analytically, numerical methods are required to obtain the solutions.

### 4.1.2. Expressions for PDFs

To evaluate the statistical moments of solute flux, knowledge of the one- and two-parcel PDFs $f_1$ and $f_2$ or an infinite number of statistical moments is required. Our approach to this Lagrangian closure problem is to evaluate a finite number of statistical moments and assume certain distributions of $f_1$ and $f_2$. In this study, it is assumed the travel time, $\boldsymbol{t}$, obeys lognormal distribution and transverse displacements, $\boldsymbol{h}$ and $\boldsymbol{x}$, satisfy the normal distributions. These assumptions are consistent with the previous numerical studies [*Bellin et al*., 1994; *Cvetkovic et al*., 1996; *Zhang et al*., 2000]. Under these assumptions, the one-parcel and two-parcel distributions of $\boldsymbol{t}$ can be expressed as

$$f_1(\boldsymbol{t}) = \frac{1}{(2\boldsymbol{p})^{\frac{1}{2}}\boldsymbol{t}\boldsymbol{s}_{\ln t}} \cdot \exp\left[-\frac{1}{2}\frac{(\ln \boldsymbol{t} - <\ln \boldsymbol{t}>)^2}{\boldsymbol{s}^2_{\ln t}}\right] \tag{4-19}$$

and

$$f_2(\boldsymbol{t}_1,\boldsymbol{t}_2) = \frac{1}{2\boldsymbol{p}\boldsymbol{t}_1\boldsymbol{t}_2\boldsymbol{s}_{\ln t_1}\boldsymbol{s}_{\ln t_2}\sqrt{1-r^2}} \cdot \exp\left\{-\frac{1}{2(1-r^2)}\left[\frac{(A)^2}{\boldsymbol{s}^2_{\ln t_1}} - 2r\frac{A\cdot B}{\boldsymbol{s}_{\ln t_1}\boldsymbol{s}_{\ln t_2}} + \frac{(B)^2}{\boldsymbol{s}^2_{\ln t_2}}\right]\right\} \tag{4-20}$$

where $r = \dfrac{\ln\left(1+ \boldsymbol{s}_{t_1 t_2} \Big/ <\boldsymbol{t}_1><\boldsymbol{t}_2>\right)}{\boldsymbol{s}_{\ln t_1}\boldsymbol{s}_{\ln t_2}} = \dfrac{\boldsymbol{s}_{\ln t_1 \ln t_2}}{\boldsymbol{s}_{\ln t_1}\boldsymbol{s}_{\ln t_2}}$, $A = \ln \boldsymbol{t}_1 - <\ln \boldsymbol{t}_1>$ and $B = \ln \boldsymbol{t}_2 - <\ln \boldsymbol{t}_2>$ .

### 4.1.3. Physical and Chemical Nonstationarity

The spatial nonstationarity of groundwater flow may be generated from the presence of physical and chemical medium nonstationarity, and/or the presence of finite boundaries, and/or the fluid pumping and injecting. Here, flow nonstationarity stemming from the combined effects of the nonstationarity in the hydraulic conductivity *Y(x)=lnK(x)*, the sorption coefficient $K_d(x)$, and the finite boundary is considered.

The physical nonstationarity in the $Y(\boldsymbol{x})$ field may manifest in two ways: the mean $<Y(\boldsymbol{x})>$ and variance $s_Y^2(\mathbf{x})$ may vary spatially, and the two-point covariance $C_Y(\mathbf{x}, \div)$ may depend on the actual locations of $\boldsymbol{x}$ and $\boldsymbol{c}$ rather than only their separation distance, where $C_y(\mathbf{x}, \div) = C_y(\mathbf{x} - \div)$ if $\mathbf{x}$ and $\mathbf{c}$ are in the same region (medium), otherwise $C_y(\mathbf{x}, \div) = 0$. Although the covariance of *Y(x)* can take any form, here we consider, for simplicity, only the exponential form

$$C_Y(\mathbf{x} - \div) = s_Y(\mathbf{x}) s_Y(\div) \exp\left\{ -\left[ \frac{(x_i - c_i)^2}{l_i(\mathbf{x})\, l_i(\div)} \right]^{1/2} \right\} \qquad (4\text{-}21)$$

where $l_i(x)$ and $l_i(c)$ $(i = 1,2,3)$ is the correlation lengths of $Y(\boldsymbol{x})$ at point $\boldsymbol{x}$ and $\mathbf{c}$, respectively, along $x_i$ axis.

The chemical sorption is assumed to be linear and equilibrium and the retardation factor, $R(\boldsymbol{x})$, is used to describe the effect of chemical sorption on solute transport. $R(\boldsymbol{x})$ is related to the chemical sorption coefficient, $K_d(\boldsymbol{x})$, as $R(x) = 1 + \frac{r_b(x)}{q(x)} K_d(x)$, where $r_b(x)$ is the medium's bulk density and $q(x)$ is the water content. Here, $r_b(x)$ and $q(x)$ are assumed to be spatially deterministical variables. Their values will be constant within each layer, but vary from one layer to another. To account for natural spatial variability and uncertainty of the chemical sorption process, $K_d(\boldsymbol{x})$ is assumed to be spatially random variable, so is $R(\boldsymbol{x})$. Furthermore, the $R(\boldsymbol{x})$ (or $K(\boldsymbol{x})$) is considered as nonstationarity (e.g., chemical nonostationarity), which may manifest in two ways: the mean $<R(\boldsymbol{x})>$ and variance $s_R^2(x)$ may vary spatially, and the two-point covariance $C_R(x, c)$ may depend on the actual locations of $\boldsymbol{x}$ and $\boldsymbol{c}$ rather than only their separation distance. Similar to $C_Y(\boldsymbol{x}, \boldsymbol{c})$, $C_R(\mathrm{x}, \div) = C_R(\mathrm{x} - \div)$ is assumed if $\mathbf{x}$ and $\mathbf{c}$ are in the same region (layer), otherwise $C_R(\mathrm{x}, \div) = 0$.

A correlation model between $R(\boldsymbol{x})$ and $Y(\boldsymbol{x})$ is needed to conduct calculation for reactive transport if $R(\boldsymbol{x})$ is a random variable. However, generally speaking, valid statements for the correlation are not easily made. Some models of the spatial variability of the retardation factor assume $R(x)$ to be either perfectly correlated or uncorrelated with the log conductivity field $Y(\mathbf{x})$ (*Valocchi*, 1989; *Destouni and Cvetkovic*, 1991; *Bellin et al.*, 1993). *Bellin and Rinaldo*(1995) suggest it may be partially correlated rather than perfectly correlated or uncorrelated. Because no *a priori* reasons exist to assume either negative or positive, or perfect or partial correlation between sorption parameters and the hydraulic conductivity, three cases of correlation are assumed here (*Bellin et al.*, 1993).

Perfect positive correlation (model A)

$$R(x) = 1 + K_d^G(x)e^{Y'(x)} \tag{4-22}$$

Perfect negative correlation (model B)

$$R(x) = 1 + K_d^G(x)e^{-Y'(x)} \tag{4-23}$$

Uncorrelated $R(x)$ and $Y(\mathbf{x})$ (model C)

$$R(x) = 1 + K_d^G(x)e^{W'(x)} \tag{4-24}$$

where $K_d^G(x)$ is the geometric mean of $K_d(x)$ and $W'(x)$ is a normally distributed random space function with zero mean, variance $s_W^2(x)$, and covariance function

$C_W(\mathbf{x}, \boldsymbol{c}) = \boldsymbol{s}_W^2(\mathbf{x})\exp\left\{-\frac{(x_i - \boldsymbol{c}_i)^2}{\boldsymbol{l}_{W_i}^2(\mathbf{x})}\right\}$ if $\boldsymbol{x}$ and $\boldsymbol{c}$ are in the same region (or layer), otherwise, $C_W(\mathbf{x}, \boldsymbol{c}) = 0$, where $\boldsymbol{l}_{W\,i}$(*i*=1,2,3) is the correlation length of $W(x)$ along the $x_i$ axis.

The mean and covariance structure of the retardation factor can be derived by expanding the exponential terms in Taylor series. This yields for the mean:

Models A and B

$$\langle R(x)\rangle = 1 + K_d^G(x)e^{\left[s_Y^2(x)/2\right]} \tag{4-25}$$

Model C

$$\langle R(x)\rangle = 1 + K_d^G(x)e^{\left[s_W^2(x)/2\right]} \tag{4-26}$$

Similarly, the covariance is given by:

Models A and B

$$C_R(\mathrm{x},\ \boldsymbol{c}) = K_d^G(x)K_d^G(\boldsymbol{c})e^{\frac{1}{2}\left[s_Y^2(x)+s_Y^2(c)\right]}\left[e^{C_Y(\mathrm{x},\ c)} - 1\right] \tag{4-27}$$

Model C

$$C_R(\mathrm{x},\ \boldsymbol{c}) = K_d^G(x)K_d^G(\boldsymbol{c})e^{\frac{1}{2}\left[s_W^2(x)+s_W^2(c)\right]}\left[e^{C_W(\mathrm{x},\ c)} - 1\right] \tag{4-28}$$

For models A and B, the cross covariance of $Y(\mathbf{x})$ and $R(x)$ is generally given by

$$C_{YR}(\mathrm{x},\ \boldsymbol{c}) = \pm K_d^G(\boldsymbol{c})e^{\left[s_Y^2(c)/2\right]}C_Y(\mathrm{x},\ \boldsymbol{c}) \tag{4-29a}$$

$$C_{YR}(\boldsymbol{c}, \mathrm{x}) = \pm K_d^G(x)e^{\left[s_Y^2(x)/2\right]}C_Y(\boldsymbol{c}, \mathrm{x}) \tag{4-29b}$$

with the plus sign for model A and the minus sign for model B.

For model C, $C_{YR}(\mathrm{x},\ \boldsymbol{c}) = 0$.

### 4.1.4. Spatial Moments of Velocity Covariance

The calculations of the various moments of travel time and transverse locations need the mean velocity and velocity covariance as the input data. *Zhang and Winter* [1999] developed a numerical moment approach for groundwater flow in a stationary conductivity field in bounded domains. As this method has only been demonstrated in two-dimensional domains, in this section, it is extended to groundwater flow in three-dimensional, nonstationary conductivity fields in bounded domains. The resulting velocity moments will serve as the input data for the transport calculation.

For incompressible groundwater flow in a heterogeneous aquifer with spatially variable hydraulic conductivity, groundwater seepage velocity, $\mathbf{V}(\mathbf{x})$, satisfies the continuity equation, $\nabla \cdot \mathbf{V}(\mathbf{x}) = 0$, and Darcy's law, $V_i(\mathbf{x}) = -\frac{K(\mathbf{x})}{n}\frac{\partial h(\mathbf{x})}{\partial x_i}$, *i*=1,2,3(the same hereafter), subject to boundary conditions $h(\mathrm{x}) = H(\mathrm{x}), x \in \Gamma_D$ and $\mathrm{V}(\mathrm{x}) \cdot \tilde{\mathrm{a}}(\mathrm{x}) = \Omega(\mathrm{x}), x \in \Gamma_N$, where $h(\mathbf{x})$ is hydraulic head, $K(\mathbf{x})$ is hydraulic conductivity (assumed to be isotropic locally), *n* is the porosity, which is assumed to be constant, $H(\mathbf{x})$ is prescribed head on Dirichlet boundary segments $\Gamma_N$, $\Omega(\mathbf{x})$ is prescribed flux across Neumann boundary segments $\Gamma_N$, and $\tilde{\mathbf{a}}(\mathbf{x})$ is an outward unit vector normal to the boundary. In this study, $H(\mathbf{x})$ is assumed to be deterministic and $\Omega(\mathbf{x})$ is assumed to be zero (no-flow boundary).

Substituting Darcy's law into the continuity equation and utilizing $Y(\mathbf{x}) = \ln K(\mathbf{x})$ yield

$$\frac{\partial^2 h(\mathbf{x})}{\partial x_i} + \frac{\partial Y(\mathbf{x})}{\partial x_i}\frac{\partial h(\mathbf{x})}{\partial x_i} = 0 \tag{4-30}$$

Summation for repeated indices is implied. Here, $Y(\mathbf{x})$ is assumed to be a random variable and is thus decomposed as $Y(\mathbf{x}) = < Y(\mathbf{x}) > + Y'(\mathbf{x})$, where $< Y(\mathbf{x}) >$ is the mean log hydraulic conductivity and $Y'(\mathbf{x})$ is the zero-mean fluctuation. In turn, *h* and *V* are also random. Since the randomness of *h* depends on that of *Y*, one may expand *h*(**x**) as,

$$h(\mathbf{x}) = h^0(\mathbf{x}) + h^1(\mathbf{x}) + h^2(\mathbf{x}) + \cdots \tag{4-31}$$

where $h^n(\mathbf{x}) = O(s_Y^n)$ and $s_Y$ is the standard derivation of *Y*. By substituting (4-31) into (4-30) and collecting terms at separate order, one can obtain the following equations governing the first two moments involving head [*Zhang*, 2002],

$$\frac{\partial^2 h^{(0)}(\mathbf{x})}{\partial x_i^2} + \frac{\partial < Y(\mathbf{x}) >}{\partial x_i}\frac{\partial h^{(0)}(\mathbf{x})}{\partial x_i} = 0 \tag{4-32a}$$

$$h^{(0)}(\mathbf{x}) = H(\mathbf{x}) \qquad \mathbf{x} \in \Gamma_D \tag{4-32b}$$

$$g_i(\mathbf{x})\frac{\partial h^{(0)}(x)}{\partial x_i} = 0 \qquad \mathbf{x} \in \Gamma_N \tag{4-32c}$$

$$\frac{\partial^2 < h^{(2)}(\mathbf{x}) >}{\partial x_i^2} + \frac{\partial < Y(\mathbf{x}) >}{\partial x_i}\frac{\partial < h^{(2)}(\mathbf{x}) >}{\partial x_i} = -\frac{\partial}{\partial x_i}\frac{\partial}{\partial \boldsymbol{c}_i}[C_{Yh}(\mathbf{x},\div)]\Big|_{\mathbf{x}=\div} \tag{4-33a}$$

$$< h^{(2)}(\mathbf{x}) >= 0 \qquad \mathbf{x} \in \Gamma_D \tag{4-33b}$$

$$g_i(\mathbf{x})\frac{\partial < h^{(2)}(\mathbf{x}) >}{\partial x_i} = 0 \qquad \mathbf{x} \in \Gamma_N \tag{4-33c}$$

$$\frac{\partial^2 C_h(\mathbf{x},\boldsymbol{c})}{\partial x_i^2} + \frac{\partial < Y(\mathbf{x}) >}{\partial x_i}\frac{\partial C_h(\mathbf{x},\boldsymbol{c})}{\partial x_i} = J_i(\mathbf{x})\frac{\partial C_{Yh}(\mathbf{x},\div)}{\partial x_i} \tag{4-34a}$$

$$C_h(\mathbf{x},\div) = 0 \qquad \mathbf{x} \in \Gamma_D \tag{4-34b}$$

$$g_i(\mathbf{x})\frac{\partial C_h(\mathbf{x},\div)}{\partial x_i} = 0 \qquad \mathbf{x} \in \Gamma_N \tag{4-34c}$$

$$\frac{\partial^2 C_{Yh}(\mathbf{x},\boldsymbol{c})}{\partial \boldsymbol{c}_i^2} + \frac{\partial < Y(\div) >}{\partial \boldsymbol{c}_i}\frac{\partial C_{Yh}(\mathbf{x},\boldsymbol{c})}{\partial \boldsymbol{c}_i} = J_i(\div)\frac{\partial C_Y(\mathbf{x},\div)}{\partial \boldsymbol{c}_i} \tag{4-35a}$$

$$C_{Yh}(\mathbf{x},\div) = 0 \qquad \div \in \Gamma_D \tag{4-35b}$$

$$g_i(\mathrm{x})\frac{\partial C_{Yh}(\mathrm{x},\div)}{\partial \boldsymbol{c}_i} = 0 \qquad \div \in \Gamma_N \tag{4-35c}$$

In the above, $h^{(0)}$ is the zeroth-order mean head, $< h^{(2)} >$ is the second-order mean head correction term, $J_i = -\partial h^{(0)} / \partial x_i$ is the negative of the (zeroth-order) mean hydraulic head gradient, $C_{Yh} =< Y'(\mathbf{x}) h^{(1)}(\div) >$ is the cross covariance between log hydraulic conductivity and head, and $C_h =< h^{(1)}(\mathbf{x}) h^{(1)}(\div) >$ is the head covariance. Since $< h^{(1)} >$ (the mean of the first-order correction term) is zero, $< h >= h^{(0)}$ to zeroth or first order in $s_Y$, and $< h >= h^{(0)} + < h^{(2)} >$ to the second order. In the above, the covariances are of second order in $s_Y$ (or first order in $s_Y^2$).

Next, how to derive the statistical moments of the velocity field is shown. From Darcy's law, for the conserve solute, the velocity can be rewritten as

$$\mathbf{V}(\mathbf{x}) = -\frac{K_G(\mathbf{x})}{n}[1 + Y' + \frac{Y'^2}{2} + \cdots]\nabla[h^{(0)} + h^{(1)} + h^{(2)} + \cdots] \tag{4-36}$$

Collecting terms at separate order, we have up to the second order

$$\mathbf{V}^{(0)}(\mathbf{x}) = -\frac{K_G(\mathbf{x})}{n}\nabla h^{(0)}(\mathbf{x}) \tag{4-37}$$

$$\mathbf{V}^{(1)}(\mathbf{x}) = -\frac{K_G(\mathbf{x})}{n}[Y'(\mathbf{x})\nabla h^{(0)}(\mathbf{x}) + \nabla h^{(1)}(\mathbf{x})] \tag{4-38}$$

$$\mathbf{V}^{(2)}(\mathbf{x}) = -\frac{K_G(\mathbf{x})}{n}[Y'(\mathbf{x}) h^{(1)}(\mathbf{x}) + \frac{Y'^2(\mathbf{x})}{2}\nabla h^{(0)}(\mathbf{x}) + \nabla h^{(2)}(\mathbf{x})] \tag{4-39}$$

It can be shown that the mean velocity is $< \mathbf{V} >= \mathbf{V}^{(0)}$ to the zeroth or first order in $s_Y$, $< \mathbf{V} >= \mathbf{V}^{(0)} + < \mathbf{V}^{(2)} >$ to second order, and the velocity fluctuation is $\mathbf{V'} = \mathbf{V}^{(1)}$ to the first order. Therefore, the velocity covariance is given as

$$C_{v_{ij}}(\mathbf{x}, \div) = \frac{K_G(\mathbf{x}) K_G(\div)}{n^2}\mathbf{[}J_i(\mathbf{x}) J_j(\div) C_Y(\mathbf{x}, \div) - J_i(\mathbf{x})\frac{\partial C_{Yh}(\mathbf{x}, \div)}{\partial c_j} - J_j(\div)\frac{\partial C_{Yh}(\div, \mathbf{x})}{\partial x_i} + \frac{\partial^2 C_h(\mathbf{x}, \div)}{\partial x_i \partial c_j}\mathbf{]} \tag{4-40}$$

The second-order correction term to the velocity is obtained from (4-39) as

$$< \mathbf{V}_i^{(2)}(\mathbf{x}) >= -\frac{K_G(\mathbf{x})}{n}[\left.\frac{\partial C_{Yh}(\div; \mathbf{x})}{\partial x_i}\right|_{\div = \mathbf{x}} - \frac{J_i(\mathbf{x})}{2} s_Y^2(\mathbf{x}) + \nabla < h^{(2)}(\mathbf{x}) >] \tag{4-41}$$

All the terms on the right-hand side of (4-40) and (4-41) are known, therefore $C_{v_{ij}}$ and $< \mathbf{V}_i^{(2)} >$ can be obtained with the availability of the moments of head.

For the linear equilibrium reactive case, the statistic description of the retarded velocity field, $V^R(\mathbf{x})$, is related to the retardation factor, $R(\boldsymbol{x})$, as

$$V^R(x) = {}^{V(x)}\!\big/_{R(x)}:$$

$$V^R(x) = \frac{\langle V(x)\rangle + V^{'}(x)}{\langle R(x)\rangle + R^{'}(x)} = \left[\langle V(x)\rangle + V^{'}(x)\right]\frac{1}{\langle R(x)\rangle}\left[1 - \frac{R^{'}(x)}{\langle R(x)\rangle} + \frac{R^{'2}(x)}{\langle R(x)\rangle^2} - \cdots\right] \tag{4-42}$$

where $V^{'}(x) = V(x) - \langle V(x)\rangle$ and $R^{'}(x) = R(x) - \langle R(x)\rangle$ are the fluctuation around the mean value of the velocity and retarded coefficient field, respectively.

The expansion (4-42), when truncated at first order and separated into zero-order and first-order term, gives the expressions for the expected value and the local fluctuation of the retarded velocity field:

$$\langle V^R(x)\rangle = \frac{\langle V(x)\rangle}{\langle R(x)\rangle} \tag{4-43}$$

$$V^{'R}(x) = V^R(x) - \langle V^R(x)\rangle = \frac{V^{'}(x)}{\langle R(x)\rangle} - \frac{\langle V(x)\rangle R^{'}(x)}{\langle R(x)\rangle^2} \tag{4-44}$$

Using (44) and (38), the retarded velocity covariance can be obtained,

$$\begin{aligned} C^R_{v_{ij}}(\mathrm{x},\div) = {} & \frac{C_{v_{ij}}(\mathrm{x},\div)}{\langle R(x)\rangle\langle R(\boldsymbol{c})\rangle} + \frac{\langle V_i(x)\rangle\langle V_j(\boldsymbol{c})\rangle}{\langle R(x)\rangle^2\langle R(\boldsymbol{c})\rangle^2} C_R(\mathrm{x},\div) \\ & - \frac{\langle V_i(x)\rangle\langle V_j(\boldsymbol{c})\rangle}{\langle R(x)\rangle\langle R(\boldsymbol{c})\rangle^2} C_{YR}(\mathrm{x},\div) + \frac{\langle V_j(\boldsymbol{c})\rangle}{\langle R(x)\rangle\langle R(\boldsymbol{c})\rangle^2}\frac{K_{G_i}(x)}{n}\frac{\partial C_{hR}(\mathrm{x},\div)}{\partial x_i} \\ & - \frac{\langle V_i(x)\rangle\langle V_j(\boldsymbol{c})\rangle}{\langle R(x)\rangle^2\langle R(\boldsymbol{c})\rangle} C_{YR}(\boldsymbol{c},\mathrm{x}) + \frac{\langle V_i(x)\rangle}{\langle R(x)\rangle^2\langle R(\boldsymbol{c})\rangle}\frac{K_{G_j}(\boldsymbol{c})}{n}\frac{\partial C_{hR}(\div,\mathrm{x})}{\partial \boldsymbol{c}_j} \end{aligned} \tag{4-45}$$

where, $\langle V_i(x)\rangle\langle V_j(\boldsymbol{c})\rangle = \frac{K_G(\mathrm{x})K_G(\div)}{n^2} J_i(\mathrm{x})J_j(\div)$, $C_{v_{ij}}(\mathrm{x},\ \boldsymbol{c})$ is the velocity covariance function for the nonreactive case, which can be expressed as (4-40), $C_{hR}(\mathrm{x},\ \boldsymbol{c})$ is the cross covariance of $h(x)$ and $R(x)$, which can be computed using a Taylor expansion in $R^{'}(x)$ as:

Models A and B

$$C_{hR}(\mathrm{x},\ \boldsymbol{c}) = \pm K_d^G(\boldsymbol{c}) e^{\left[ s_Y^2(c) / 2 \right]} C_{hY}(\mathrm{x},\ \boldsymbol{c}) \tag{4-46a}$$

$$C_{hR}(\boldsymbol{c},\ \mathrm{x}) = \pm K_d^G(x) e^{\left[ s_Y^2(x) / 2 \right]} C_{hY}(\boldsymbol{c},\ \mathrm{x}) \tag{4-46b}$$

where the upper and the lower signs are valid, respectively, for model A and model B.

For model C, $C_{hR}(\mathrm{x},\ \boldsymbol{c}) = C_{hR}(\boldsymbol{c},\ \mathrm{x}) = 0$ .

The analysis from 4.1.1 to 4.1.1 has completed the derivations for groundwater flow and solute transport. The main assumptions applied in the theory development are summarized as: 1) steady-state flow, 2) deterministic hydraulic boundary conditions, 3) no sink or source in the study domain, 4) nonstationary (or zonal stationary) distributions of conductivity and retardation factor, 5) instant or continuous source release, 6) linear and equilibrium sorption, 6) perfect or no correlation between *Y* and *R* and 7) no radioactive decay. The final calculation results are the mean and variance of the solute flux.

### 4.1.5. Numerical Implementation

The solutions of the flow and transport moments can be obtained analytically only under some specific conditions as those required in the classic stationary theory [*Gelhar and Axness*, 1983; *Dagan*, 1982, 1984], such as the stationary flow field, no-boundary influence and simple initial condition. In general, numerical methods are required to obtain the solutions.

*Zhang and Winter* [1999] applied a finite difference method (FDM) to obtain the two-dimensional solution for the mean and variance of hydraulic head. In this study, this method is extended to three-dimensional flow moments. The spatial derivatives are discretized via the central-difference approximations. The three-dimensional study domain is discretized into $M_x \times M_y \times M_z$ cells. From the numerical implement of the derivatives and rearrangements of the equations, we obtain the means and covariances of the hydraulic head and velocity at the numerical grid points. The values of the means and covariances at any other points within the study domain are approximated through interpretation of their values at the numerical grid points. The obtained calculation results are used as input data for the calculation of solute transport.

The transport theory is set up through the Lagrangian perturbation method. The key is to obtain the first and second moments of the solute particle travel time and transverse locations. The numerical solutions of the first two moments are separated into three parts: 1) approximation of the initial plume by a discrete particle distribution, 2) calculation of each particle's expected trajectory (or the first moments), 3) calculation of the one- and two-parcel covariances of travel time and transverse locations.

**Initial Condition**. In this report, the case of instantaneous release of the solute is focused on:

at time $t$ = 0, a solute of total mass $M$ is released into the flow field over the injection area $A_0$ ($m^2$) located at $x$ = 0 instantaneously. An areal density of injected solute mass at the location $\mathbf{a} \in A_0$ is donate by $\rho_0(a)$ $[M/L^2]$. $A_0$ is then divided uniformly into N parts, and one parcel with no volume exists in each part's center located at $\mathbf{a}_i = (0, y_i, z_i)$ with the mass, $\Delta M_i = \rho_0(a_i)A_0/N \quad (i = 1, \cdots, N)$ and $M = \sum_i \Delta M_i$. The discretized mass distribution will be used to represent the continuous initial plume distribution.

**First Moment of Each Parcel's Travel Time and Transverse Locations**. The control plane (CP) is a ($y$,$z$) plane at a distance $L$ from the source plane. For each parcel located originally at $a_j$, its mean tracer line from $a_j$ to the control plane is calculated. The parcel's longitudinal position, $x$, is chosen to be an independent variable. Its total length along $x$, $L$, is divided as $N$ equal increments, $\delta x = L/N$. $\delta x$ is required to be smaller than the numerical grid $\Delta x$ for the calculation of the hydraulic head and the velocity. The forward-difference approximation is applied to (4-9) and (4-10) to obtain the parcel's transverse locations at each increment of $\delta x$, with the initial condition, $x_0 = 0, <\eta(x_0;\mathbf{a}_j)> = y_j, <\xi(x_0;\mathbf{a}_j)> = z_j$.

The velocity at point $(x_i, <\eta_i>, <\xi_i>)$, $U_l(x_i, <\eta_i>, <\xi_i>)$ $(l = 1,2,3)$, is determined from the velocity values at its neighboring numerical grid points. The method for computing the first moments is similar to the numerical particle tracking method [e.g., *Hassan et al*., 1998]. With the results of $(x_i, <\eta_i>, <\xi_i>)$ and $U_l(x_i, <\eta_i>, <\xi_i>)$ $(l = 1,2,3)$, the central-difference method is used to approximate the various velocity differentiations.

**Joint Moments of Travel Time and Transverse Locations**. From the calculated parcel trajectory positions, $(x_i, <\eta_i>, <\xi_i>)$, the mean velocities and velocity covariances at these positions are interpolated from their values at the numerical grid points. With these results as input data, the solutions for the various covariance functions of solute flux are numerically obtained. In the calculation, first $<u_i\eta'>$ and $<u_i\xi'>$ are solved with the forward-difference method, then the solutions of $<\eta'\xi'>$, $<\xi'\xi'>$ and $<\eta'\eta'>$ are obtained, last $<\tau'\tau'>$ is obtained. All the covariances have deterministic initial conditions. Through (4-19) to (4-20), we can obtain the parcel PDFs $f_1$ and $f_2$, respectively.

With the calculated results of $f_1$ and $f_2$, the mean and variance of the total solute flux through the control plane can be calculated from (4-2) and (4-3).

### 4.1.6. Numerical Code Development

Based on the methods introduced above, a numerical code, NMM3D, has been developed. The code is for the calculation of means and variances of solute flux through a control plane downstream of a contaminant source. The code was reviewed by the DOE YMP QA office and was installed in a computer called Wilddog, a dual-processor work station, located at DRI in Las Vegas. All calculation for solute transport was conducted using this computer.

## 4.2. Study Results

The developed NMM3D code in this study is applied to study solute transport in the saturated zone below the YMP area. The input data for the calculation include hydraulic boundary and solute initial conditions, conductivity correlation functions in the layers and sorption coefficients for layers if the chemical is reactive.

### 4.2.1. Model Assumptions

Based on the previous hydrogeological studies and the focus of this study, the following assumptions are made for the groundwater flow:

a. Groundwater flow is assumed to be steady-state.
b. The effective continuum representation will be applied to model the rock media in the saturated zone of the study domain.
c. Temperature is assumed to be constant.
d. The aquifer in the domain is assumed to be a confined aquifer.
e. Regional groundwater simulation result [*Czarnecki et al.*, 1997] is used to set up the hydraulic conditions in the study area. Since the groundwater flow is basically in the north-south direction, the constant head boundary conditions are used for the north and south boundaries. The other boundaries are assumed to be no-flow boundaries. It should be pointed out that even though there exists groundwater recharge from the top of the study domain, however, the recharge amount is much less that horizontal groundwater flow. Therefore, the top boundary is assumed to be no-flow.

The saturated medium is composed of multiple layers of different materials. These materials in different layers have quite different physical properties (e.g., hydraulic conductivity). Even within a single layer, significant spatial heterogeneity of hydraulic conductivity has been observed [*Shirley et al*., 1997]. However, owing to the tremendous calculation demand in conducting Monte Carlo simulations to study the influence of heterogeneity within each layer on groundwater flow and solute transport, current numerical modeling efforts are limited to deterministic approaches with effective parameter values, such as the mean conductivity and macrodispersivity to study expected solute transport process. Here, the moment method is used to address prediction uncertainty.

The study domain is shown in Figure 4-1a. It ranges 5,500 m $\times$ 5,000 m horizontally and 990 m vertically. There are seven zones within this domain. The mean of the log conductivity, the variances and correlation lengths within each zone are listed in Table 3-1. For the purposes of this study, the correlation function of log conductivity in each zone is assumed to be exponential, and no correlation is assumed between different zones. Becides the nonreactive chemical, two other chemicals with weak and strong sorption capacities were chosen for this study. The sorption processes of the two compounds are assumed to be linear and equilibrium, and sorption coefficient, $K_d$, or retardation factor, $R$, are used to mathematically describe the sorption processes.

The NMM3D could be used to calculate reactive solute transport with random *R*. However, currently available sorption data are too few to determine the spatial variation of *R* within each layer. Therefore, the sorption coefficients of the two compounds are assumed to be constant within each layer, but will be different from one layer to another. With the increase of the sorption measurements, the retardation factor in the future study may be treated as random variable and the NMM3D could be also used to study the influence of randomness of *R* on solute transport. In this study, the sorption coefficient values of the two compounds at the layers are shown in Table 3-2. The bulk density, $r_b$, and water content, $q$ ,is the water content are also assumed to be constant within each layer. Its values at different layers are shown in Table 3-2. The parameter data used for NMM3D calculation were generated [UCCSN Data ID No.: 025XH.001] and shown in appendix A.

According to the regional modeling study, the right (south) and left (north) sides are assigned constant heads of 736 m and 1,000 m, respectively, and the other four boundaries are assumed to be no-flow. A 50 m × 50 m planar source with 1.0 kg/m$^2$ mass density in the all source area, perpendicular to the mean flow direction (*y*-coordinate), is put in a place 50 m away from the northern boundary. Three different locations (vertically) of the source, shown in the figure, are chosen for a sensitivity study. The centers of upper, middle and lower source planes are at 45 m, 450 m and 675 m, respectively, below the top layer. A control plane is chosen to be at 50 m upstream from southern (right) boundary. Real time and distance are used in this case study.

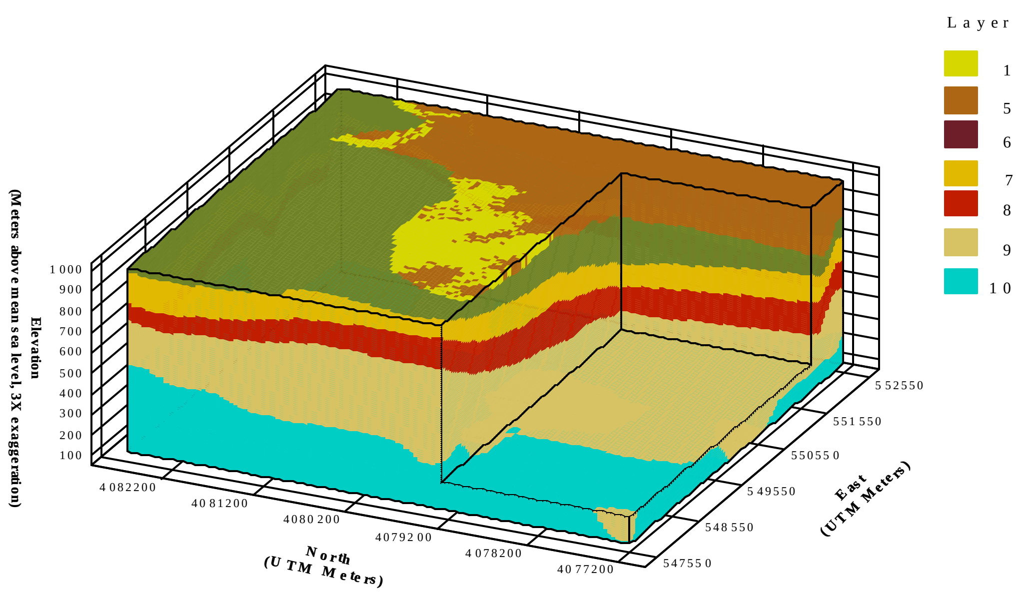



Figure 4-1a. Distributions of the layers in the study domain.

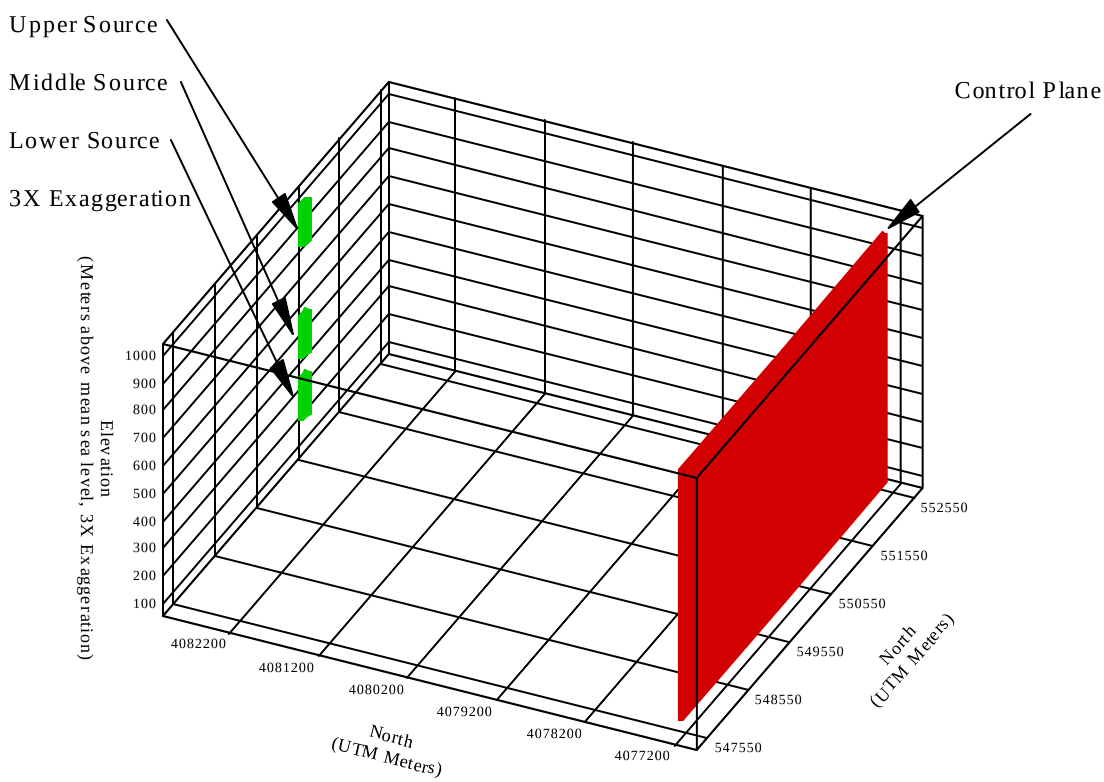



Figure 4-1b. Locations of the sources and control plane.

### 4.2.2. Calculation Results of Mean, Variance and Upper Bound of Solute Flux

Based on the assumptions above, NMM3D was applied to calculate the means, <*Q*>, and variances, $s_Q^2$, of solute flux for the three chemicals with three different source locations. According to the mean and variance results, the upper bound of the solute flux was calculated, $upper\ bound = < Q > + s_Q$ . The calculation results are shown in appendix B to J [UCCSN Data No.: 025XH.001]. The breakthrough curves of the three chemical compounds for the three source locations are shown in Figures 4-2 to 4-10, respectively. The unit of the mean solute flux in these figures is *kg/year*.

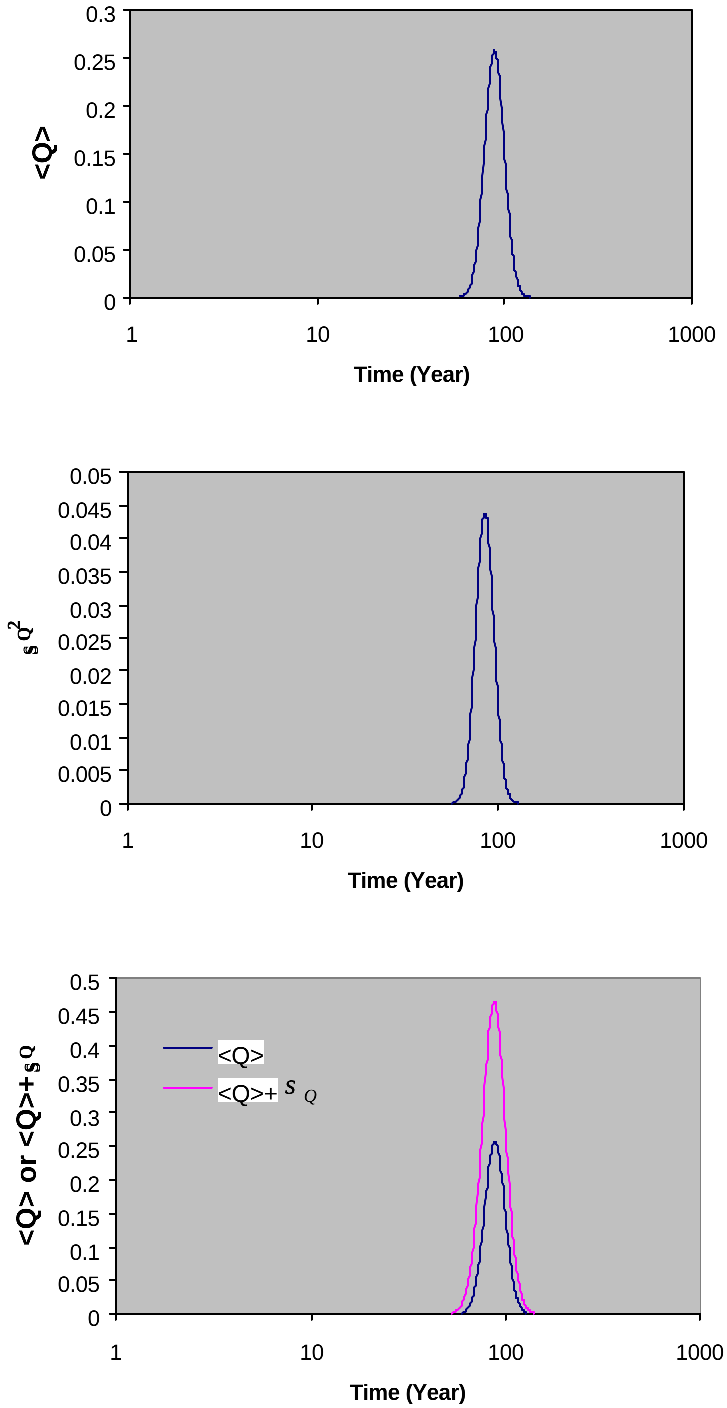



Figure 4.2. Solute flux breakthrough curves of the nonreactive chemical for the upper source : (a) mean, (b) variance and (c) upper bound.

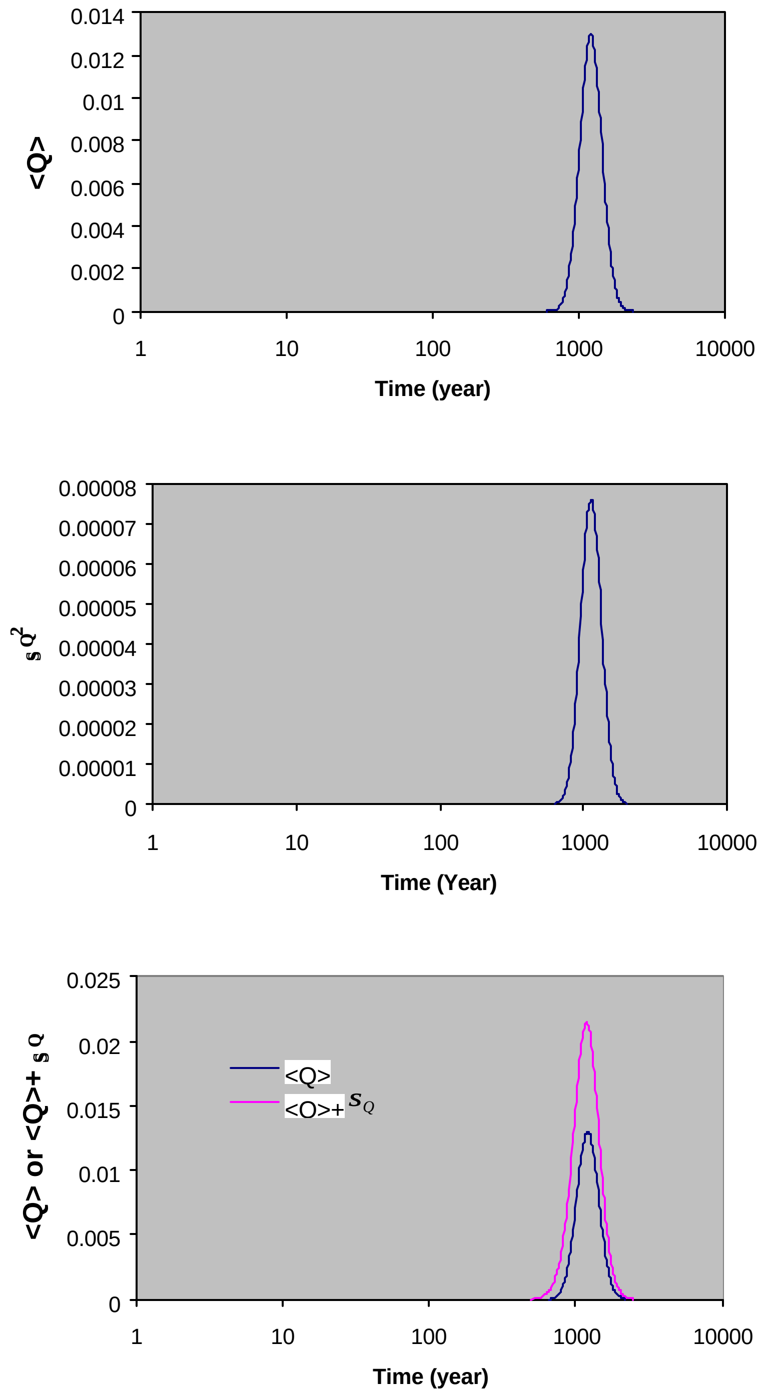



Figure 4.3. Solute flux breakthrough curves of the weak sorption chemical for the upper source : (a) mean, (b) variance and (c) upper bound.

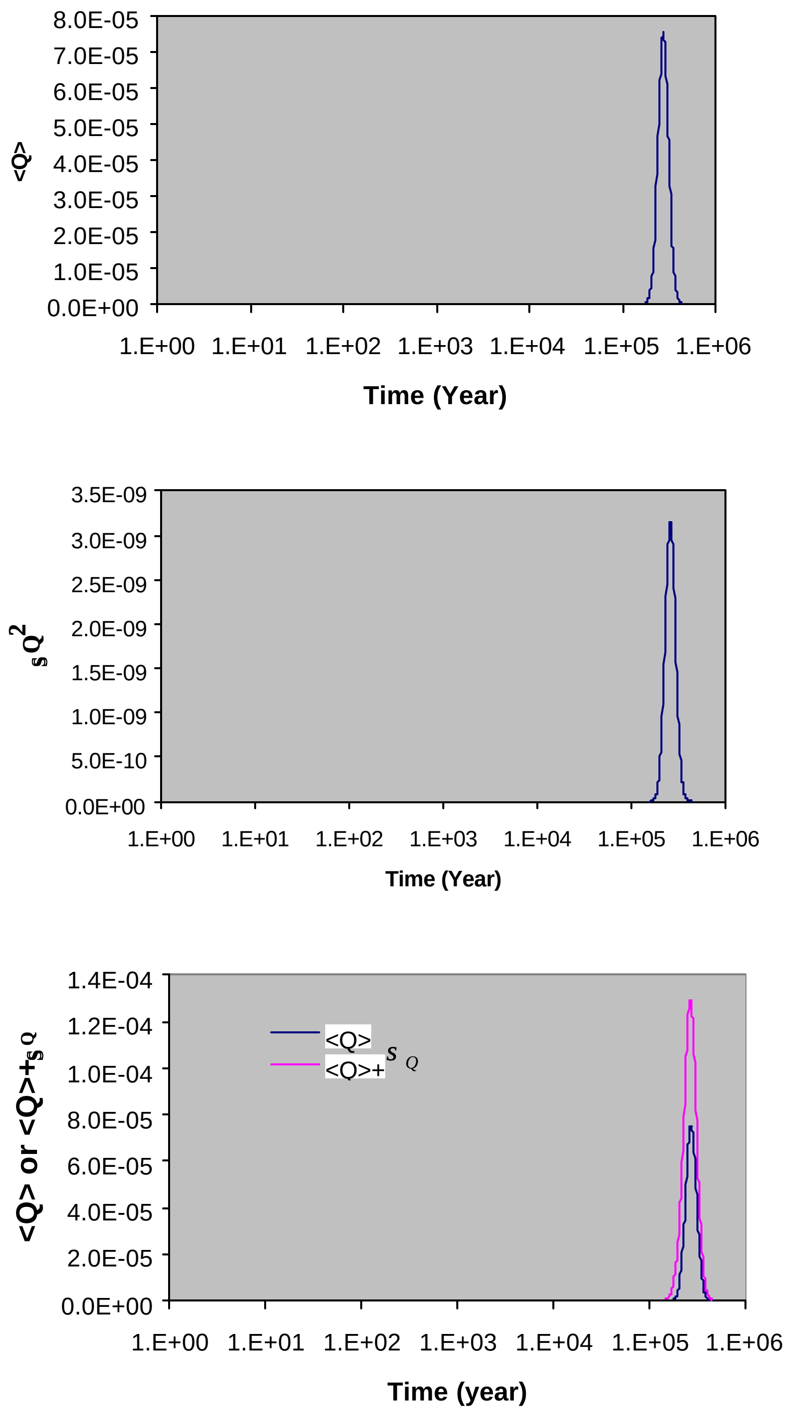



Figure 4.4. Solute flux breakthrough curves of the strong sorption chemical for the upper source : (a) mean, (b) variance and (c) upper bound.

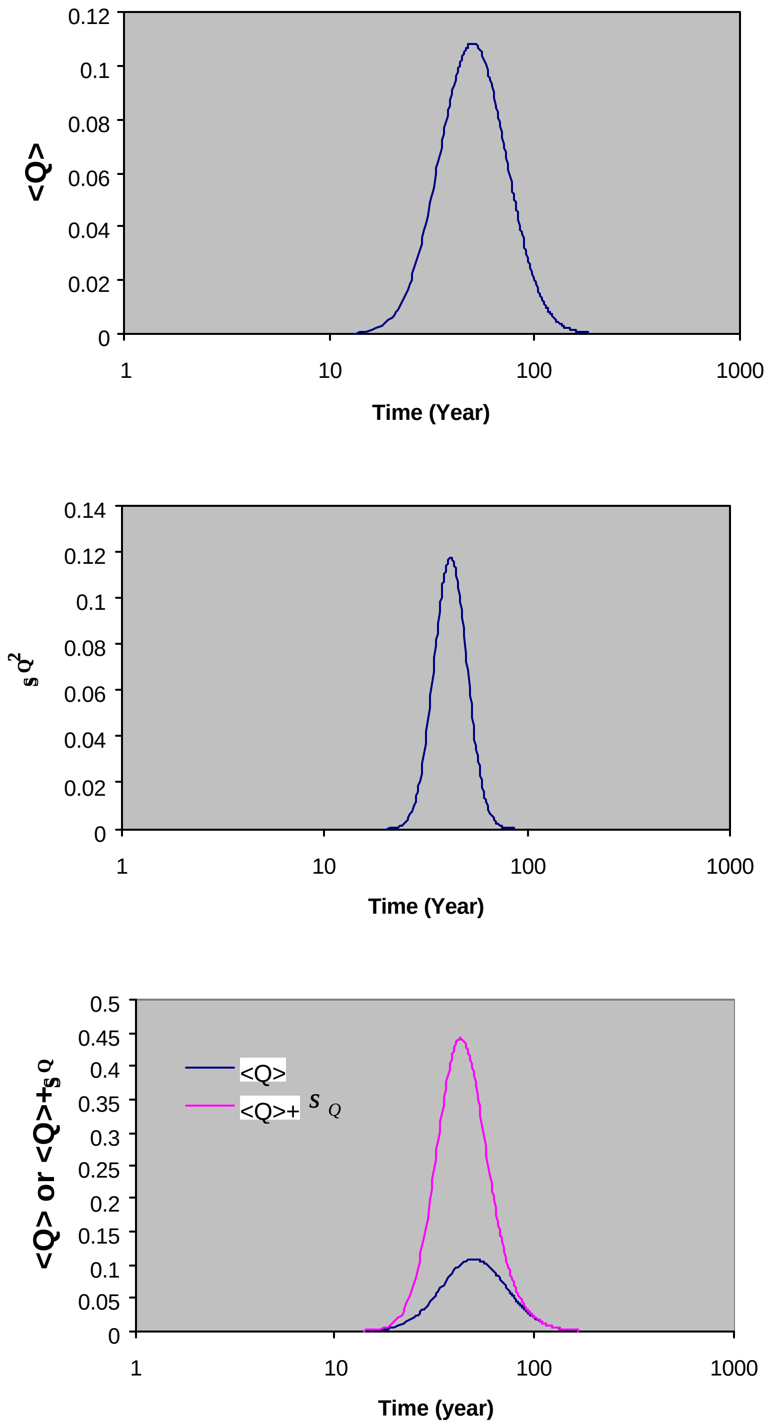



Figure 4.5. Solute flux breakthrough curves of the nonreactive chemical for the middle source : (a) mean, (b) variance and (c) upper bound.

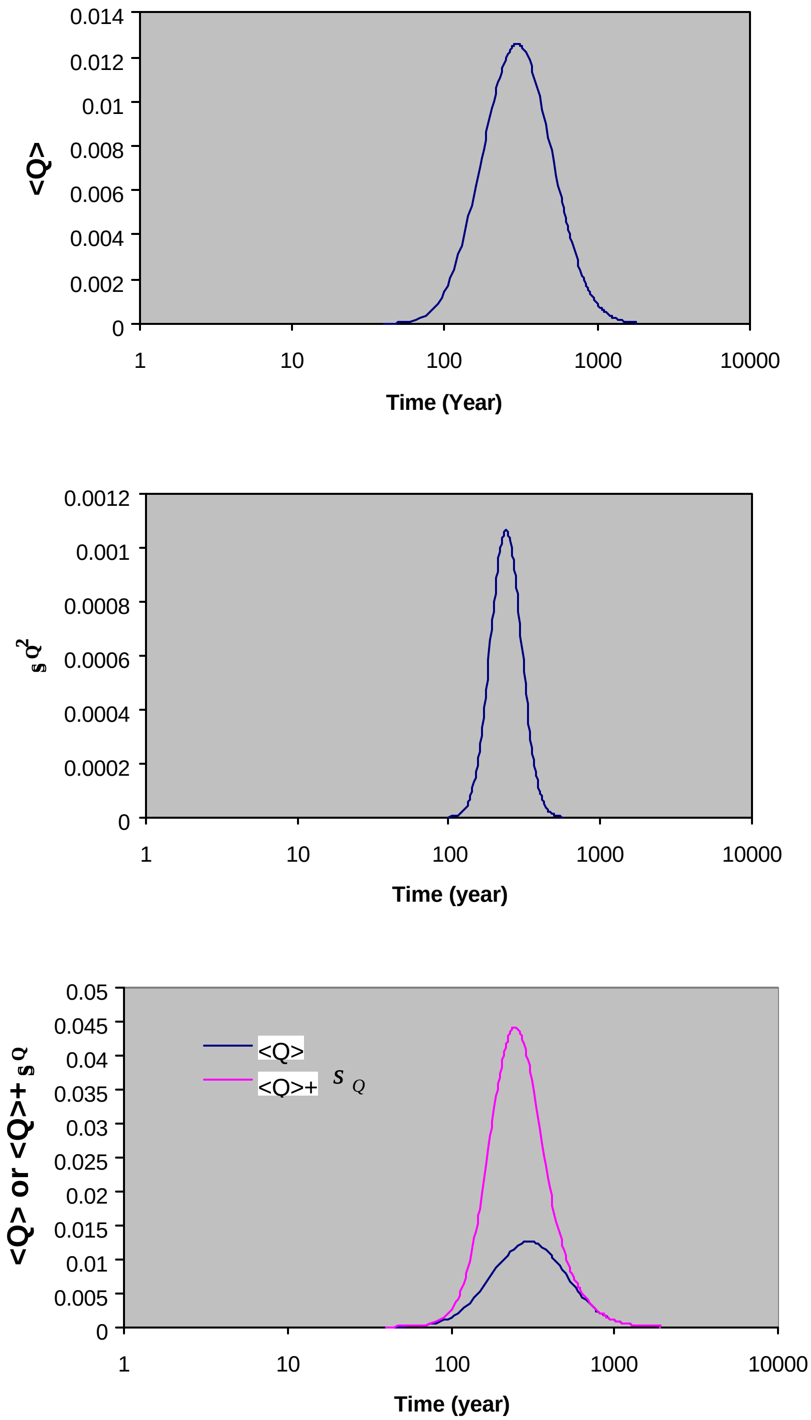



Figure 4.6. Solute flux breakthrough curves of the weak sorption chemical for the middle source : (a) mean, (b) variance and (c) upper bound.

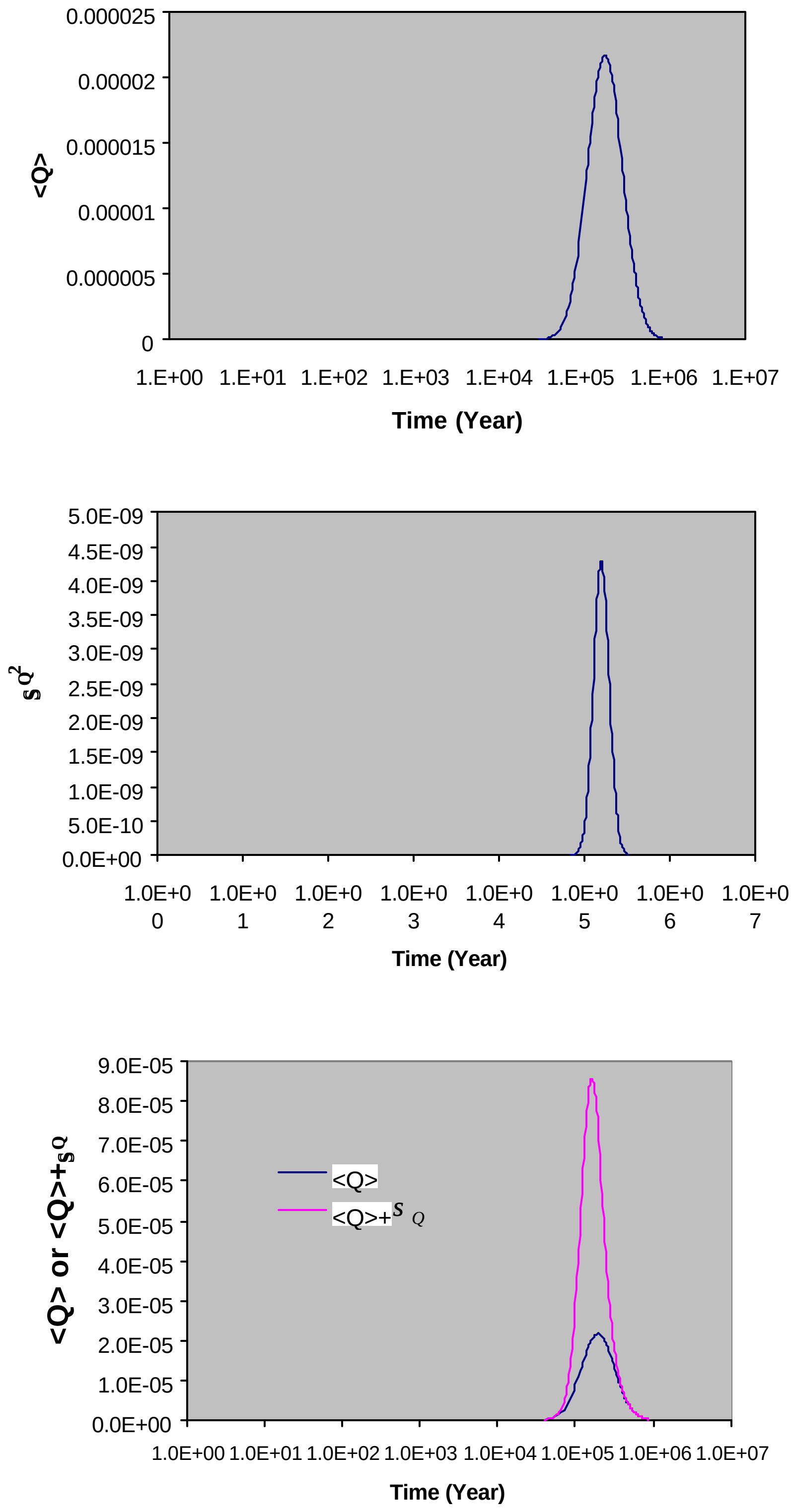



Figure 4.7. Solute flux breakthrough curves of the strong sorption chemical for the middle source : (a) mean, (b) variance and (c) upper bound.

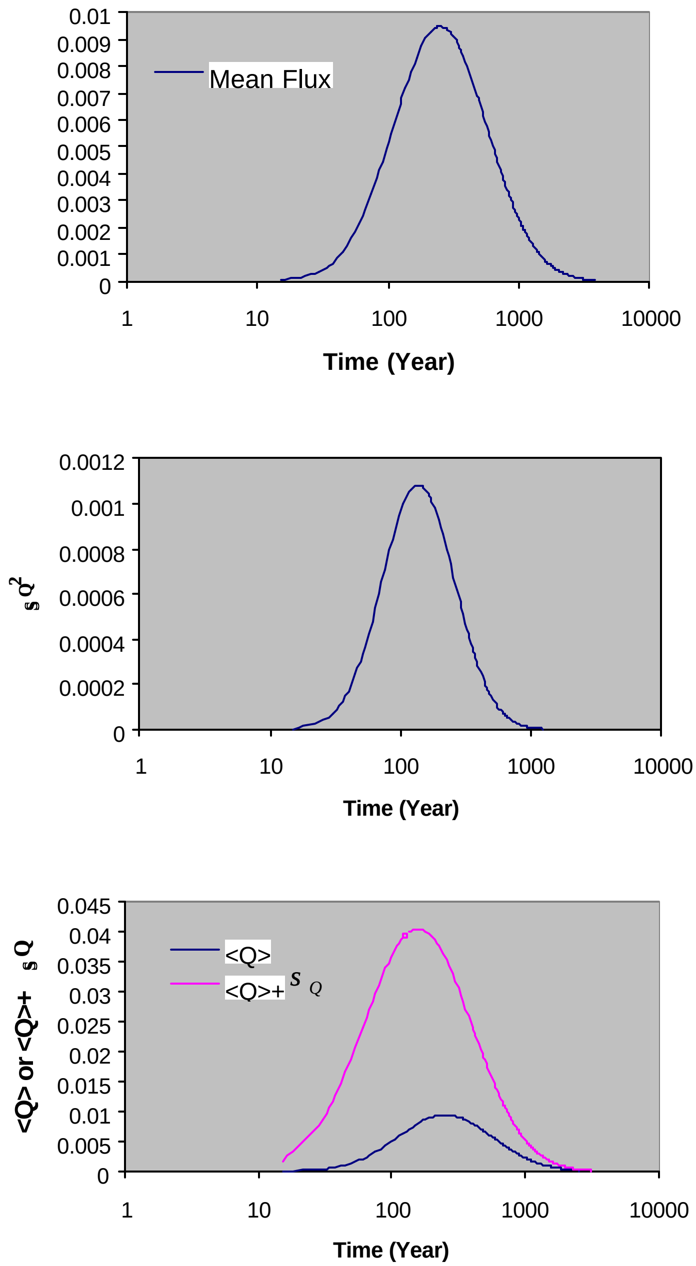



Figure 4.8. Solute flux breakthrough curves of the nonreactive chemical for the lower source : (a) mean, (b) variance and (c) upper bound.

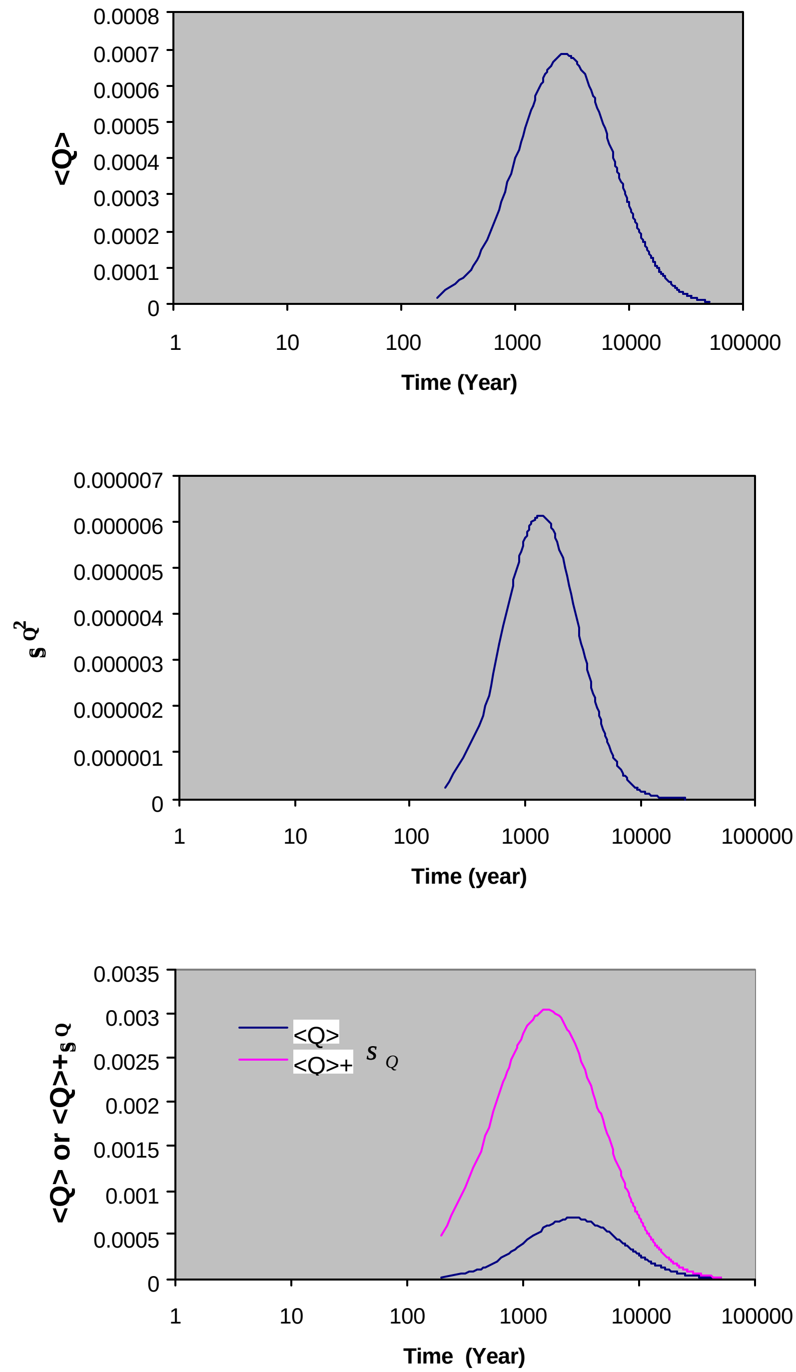



Figure 4.9. Solute flux breakthrough curves of the weak sorption chemical for the lower source : (a) mean, (b) variance and (c) upper bound.

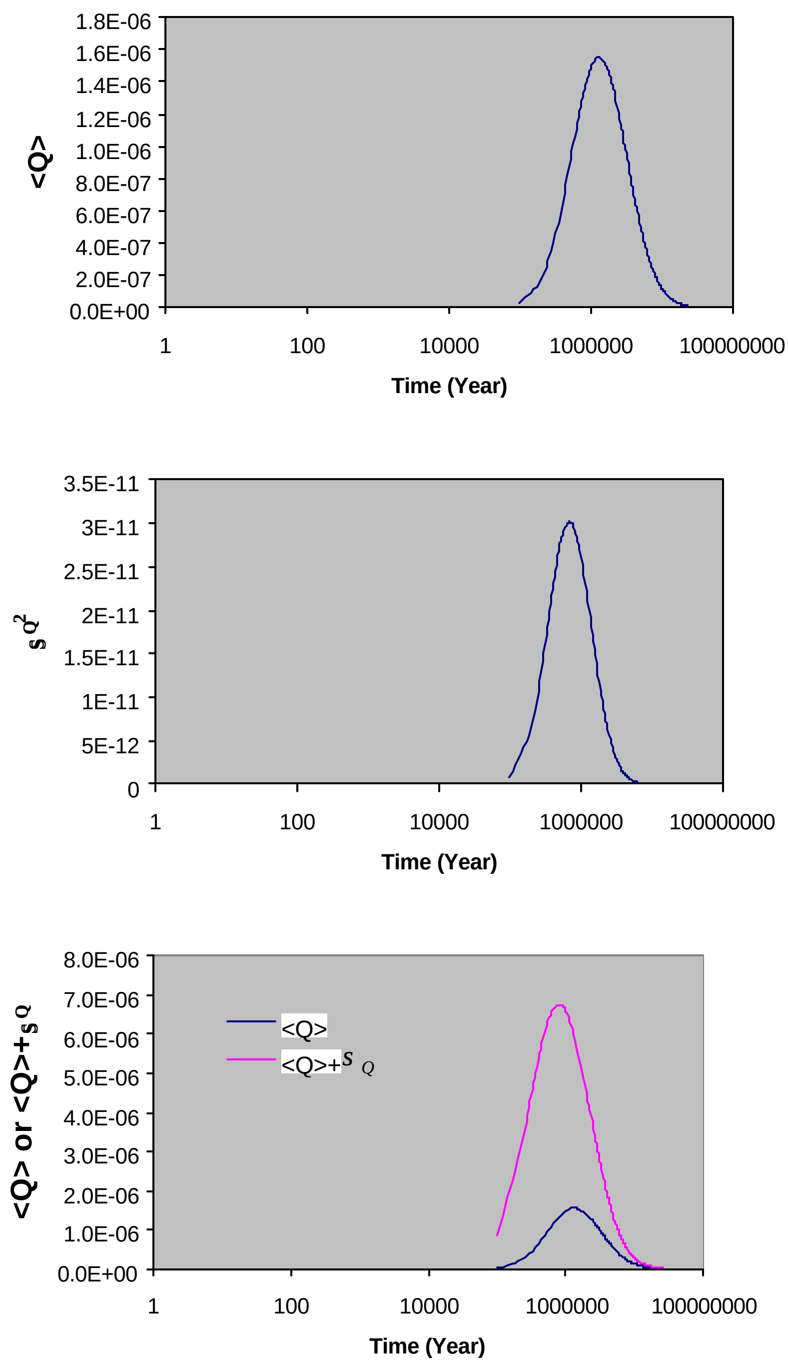



Figure 4.10. Solute flux breakthrough curves of the strong sorption chemical for the middle source : (a) mean, (b) variance and (c) upper bound.

Figures 4-2 to 4-10 show mean solute breakthrough curves, variances about the means and upper bound of the prediction with three different contaminant sources at three different locations. Generally speaking, the variance is proportional to the mean value. The solute travels fastest when the source area is in the middle, and slowest when the source area is at the bottom. This is consistent with the flow-line trajectory. When the solute encounters a fast channel, the solute has a fast mean movement and small mean dispersion, as opposed to a slow mean movement and large mean dispersion for a slow channel.

From the calculation results of nonreactive solute flux, the mean transport times from the three source locations are about 90 (upper), 50 (middle) and 200 (lower) years, respectively. The upper bound results indicate that the uncertainty results will significantly influence both the solute transport time and solute flux quantity. From the conservative consideration (5 percent of the peak value), the solute will not reach the control plane for 75 years for the upper source case, 20 years for the middle source case, and 40 years for the lower source case.

It is shown from the calculation results that different layers will play different roles for the solute dispersion process. Figures 4.2, 4.5 and 4.8 show that when the source is put in the lower location, the solute is largest dispersed, the largest range of the breakthrough time and the lowest peak value (less than 0.01 *kg/year*), and the peak of upper bound is three times larger than the mean peak value. When the source is located in the upper location, the solute is least dispersed, the smallest range of the breakthrough time and the highest mean peak value (peak value is about 0.26 *kg/year*), and the peak of the upper bound is about twice as much as the peak value of the mean prediction. When the source is located in the middle location, the solute dispersion is between the other two cases. The peak value is about 0.12 *kg/year*. However, the variance of the solute flux is very large. The peak value of the upper bound is about four times as large as the mean peak value. The time range of the mean breakthrough curve is almost the same as the range of the upper bound curve. Due to the source location, the different prediction results of the solute flux are attributed to the different geostatistical log-conductivity values of the layers through which the solute pass. The larger the mean value of a layer's conductivity, the faster the mean solute transport through the layer. The larger the variance and correlation length, the larger the solute dispersion and smaller the peak value of the solute flux.

As shown in Figures 4.3, 4.6 and 4.9, the transport times of the solute peak for the weakly sorbed chemical are about 1,100 years, 250 years and 2,500 years for the upper, middle and lower sources, respectively, which are about 12, 5 and 24 times, respectively, larger than their counterparts for the nonreactive chemical. From a conserveative standpoint, the weak sorption solute will not reach the control plane for 850 years for the upper source, 100 years for the middle source and 150 years for the lower source. The other characteristics of the beakthrough curves are similar to their counterparts for the nonreactive solute.

For the strong sorption chemical, the solute transport time through the control plane is tremendously delayed. From Figures 4.4, 4.7 and 4.10, one can see that the solute flux peak will pass the control plane at about 300,000 years for the upper source, 200,000 years for the middle source, and 1,100,000 years, respectively, which will roughly be 3,300, 4,000 and 5,500 times, respectively, larger than their counterparts for the nonreactive solute. The strongly sorbing chemical will not pass the control plane for 200,000 years, 85,000 years and 50,000 years for the source in the upper, middle and lower locations, respectively.

The calculation times for the non-reactive, weakly sorbing and strongly sorbing chemicals with three source locations are about 7.5, 8.5 and 10.0 hours, respectively.

Though not shown in the figure, one may imagine that with an increase in the source area, the solute dispersion will significantly increase due to strong heterogeneity in the vertical direction. The predicted variance values are larger than the mean values, which is to say that, the mean prediction may significantly deviate from the actual solute transport. To decrease the variance, conditioning on field measurements is required.

# 5. Comparison of the Results by Method of Moments and Monte Carlo Simulation

In the last section, the numerical method of moments has been developed and applied to study the transport processes of non-reactive, weakly sorbing and strongly sorbing chemicals through the study domain. The newly developed method needs to compare with a well-developed method to verify the calculation results. In this section, a Monte Carlo numerical simulation method was applied to check the results obtained by the method of moments. The Monte Carlo method has been widely applied to study the influence of heterogeneity on flow and transport in many environmental projects, the method is treated as a "standard" method; its results will be compared with those by the method of moments. For the purpose of comparison, only the two methods' results for conservative solute transport were compared.

## 5.1. Generating the Realizations of Hydraulic Conductivity Field and Porosity Field

The computation domain and hydraulic boundary conditions are exactly the same as those used in the last section. The simulation domain is composed of seven distinct lithofacies. The values of mean $\ln K$ , variance and correlation lengths in each layer are shown in Table 3-1. Instead of using a correlation function to describe the heterogeneity of conductivity within each layer, the Monte Carlo method was applied to generate multi-realizations of conductivity distribution. To accurately capture the horizontal and vertical variability of the hydraulic conductivity of the aquifer, a fine uniform grid discretization of $\Delta x$ = 50 m, $\Delta y$ = 50 m and $\Delta z$=10 m was used, yielding a three-dimensional grid with 990,000 blocks. The interfaces between different lithofacies were determined from borehole data and treated as deterministic. The variability of $\ln K$ inside each layer was incorporated into the conductivity model via a Sequential Gaussian Simulator provided in GSLIB. The porosity values in the layers are listed in Table 3-1. Figure 5-1 shows one realization of the $\ln K$ field and the porosity distribution map. A total of 2,000 realizations of the $\ln K$ field was generated to ensure the convergence of the Monte Carlo simulation [UCCSN Data ID no.: 025CS.002].

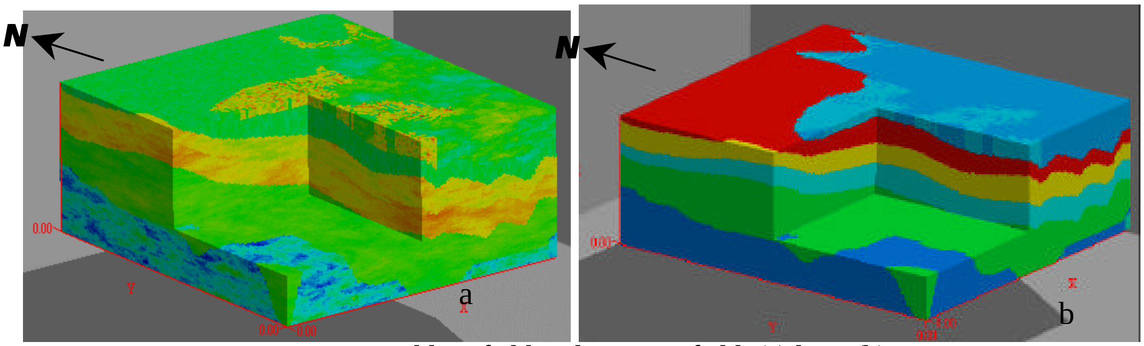



Figure 5-1. Generated ln*K* field and porosity field. (a) lnK; (b) porosity.

### 5.2. Groundwater Flow and Solute Transport Simulations

According to the model assumptions made in previous sections, the mean flow direction is assumed to be parallel with the *y* direction (north-south). Thus, the northern and southern boundaries are set to be fixed head boundaries, which produce an average hydraulic head gradient of 0.05 along the *y* direction from north toward south. No-flow conditions are imposed along all remaining boundaries. The groundwater flow is also assumed to be steady state.

A three-dimensional flow simulator based on finite difference techniques was used to solve the flow equation subjected to the above boundary conditions to obtain the hydraulic head and the corresponding groundwater velocity distributions within the computation domain. The flow simulator adopts a multi-grid linear system solver, which allows quick solution for the discretized flow equations. On a DELL Precision WorkStation 530 MT equipped with a 2.0 GHz processor and 4G RAM, the CPU time required to solve the flow problem for each realization is about 7 minutes.

After the groundwater velocity distribution was obtained through the flow simulation, a streamline, particle-tracking approach was applied to simulate the movement of solutes with the groundwater flow. The solute plume is represented by a large number of particles. Therefore, the calculation of solute flux across a control plane becomes the calculation of arrival times of individual particles reaching the control plane. For each individual particle, its travel time $t_s$ before reaching the control plane is simply book-marking its trajectory (streamline) and summing up travel times within all the cells through which the streamline passed . As shown in Figure 5-2, giving the entering coordinates of a streamline into a cell, $(x_i, y_i, z_i)$, and assuming linear interpolation of velocity inside the cell, the

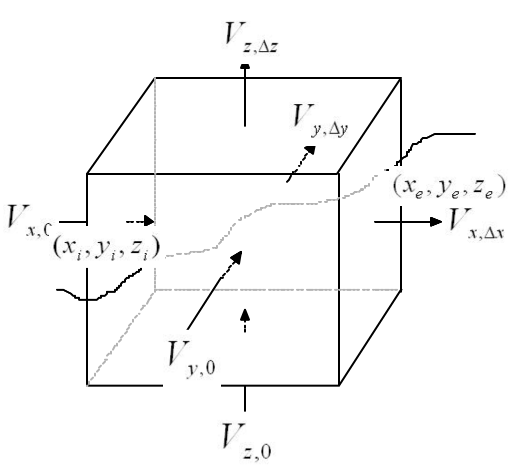



Figure 5-2. Illustration for travel time calculation through a cell

exit coordinates of that streamline leaving the cell, $(x_e, y_e, z_e)$, can be explicitly calculated [*Datta-Gupta and King*, 1995; *Pollock*, 1989], and the travel time within that cell, $\Delta t_{s,c}$, can also be obtained through the following formulas:

- If the streamline exits the cell along the X-direction,

$$\Delta t_{s,c} = \frac{\Delta x}{V_{x,\Delta x} - V_{x,0}} \ln\{\frac{V_{x,0} \cdot \Delta x + (V_{x,\Delta x} - V_{x,0})(x_e - x_0)}{V_{x,0} \cdot \Delta x + (V_{x,\Delta x} - V_{x,0})(x_i - x_0)}\} \tag{5-1}$$

- If the streamline exits the cell along theY-direction,

$$\Delta t_{s,c} = \frac{\Delta y}{V_{y,\Delta y} - V_{y,0}} \ln\{\frac{V_{y,0} \cdot \Delta y + (V_{y,\Delta y} - V_{y,0})(y_e - y_0)}{V_{y,0} \cdot \Delta y + (V_{y,\Delta y} - V_{y,0})(y_i - y_0)}\} \tag{5-2}$$

- If the streamline exits the cell along the Z-direction

$$\Delta t_{s,c} = \frac{\Delta z}{V_{z,\Delta z} - V_{z,0}} \ln\{\frac{V_{z,0} \cdot \Delta z + (V_{z,\Delta z} - V_{z,0})(z_e - z_0)}{V_{z,0} \cdot \Delta z + (V_{z,\Delta z} - V_{z,0})(z_i - z_0)}\} \tag{5-3}$$

where $\Delta x$, $\Delta y$ and $\Delta z$ are the cell dimensions.

Similar to the last section, a 50 m$\times$ 50 m planar source, perpendicular to the mean flow direction (*y*-coordinate), was initiated in the upper, middle and lower locations. A control plane located at 50 m upstream from the southern boundary was set up to collect the solutes. A total number of 40,000 particles was used to represent the initial plume. Though not shown here, further increase on particle numbers does not significantly affect the calculation results of the breakthrough curves across the control plane anymore. On a DELL Precision WorkStation 530 MT equipped with a 2.0 GHz processor and 4GB RAM, the CPU time required by our streamline-based transport simulator for each realization is only about 36 seconds.

### 5.3 Simulation Results and Discussion

A total of 2,000 realizations of hydraulic conductivity field were generated, and each realization ran through flow and transport simulations to obtain the solute flux breakthrough curves across the CP. Figure 5-3 shows some arbitrarily chosen realizations of the solute flux across the control plane. As shown in this figure, each individual realization significantly differs from the others, revealing the large uncertainties associated with the predictions.

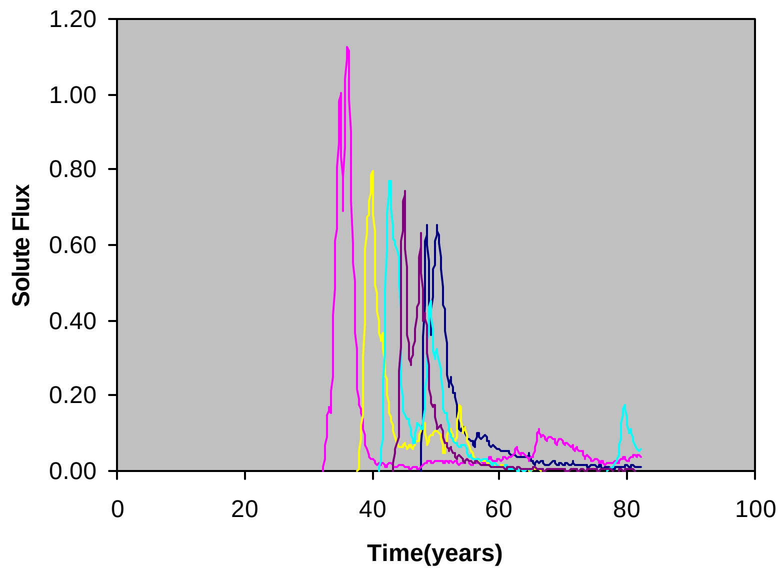



Figure 5-3. Realizations of solute flux across the control plane.

The obtained multi-realizations of the solute flux curve were averaged over realizations to obtain the mean and variance of the solute flux. One critical concern associated with the Monte Carlo simulation is its convergence issue, specifically, the convergence of mean and variance of solute flux. Figures 5-4a and 5-4b show the Monte Carlo-simulated mean and variance of solute flux, averaged over 500, 1,000, 1,500 and 2,000 realizations , respectively, for the middle source case. As the mean solute flux curve quickly smoothed out and converged after a couple of hundred realizations, however, the variance curve of the solute flux still required more realizations to smooth out and converge. As shown in Figure 5-4b, after 2,000 realizations, the variance curve still remains a little spiky, but clearly, it starts to converge after 1,000 realizations. Therefore, our Monte Carlo simulation stops after 2000 realizations. Figure 5-5 shows the simulated mean solute flux curve and the 95 percent confidence bounds. Obviously, a large uncertainty associated with the predicted mean solute flux curve has occurred.

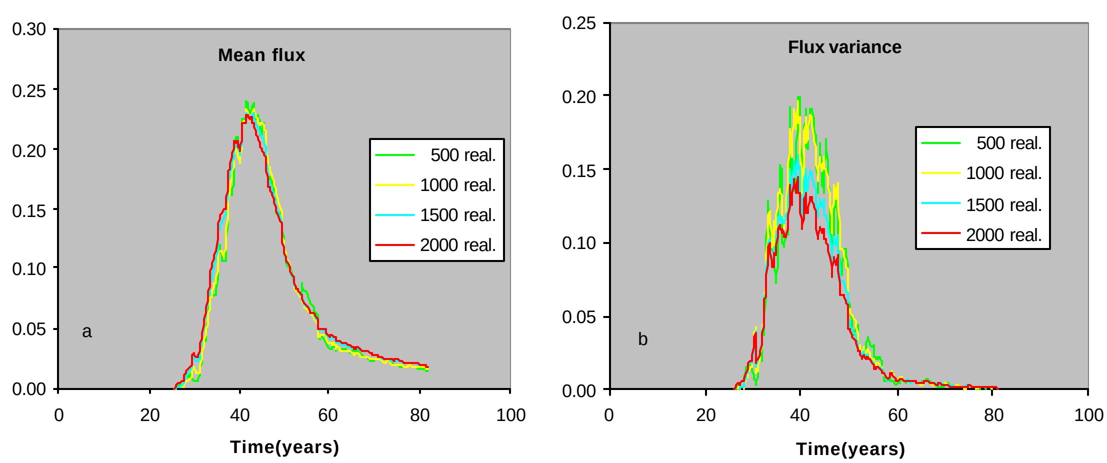



Figure 5-4. Monte Carlo-simulated mean and variance of solute flux vs. realization numbers.

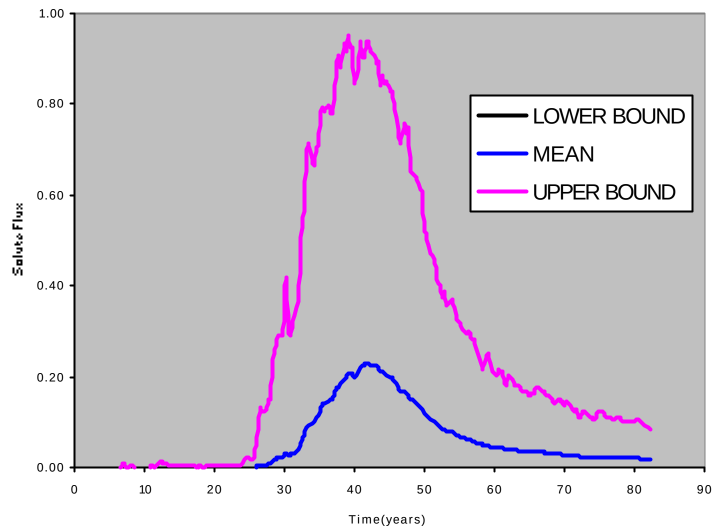



Figure 5-5. Monte Carlo-simulated mean solute flux and its 95% confidence bounds

Figures 5-6 to 5-8 are used to compare the results of the Monte Carlo simulation and method of moments. It is shown from the three figures that the prediction results by the two methods are very close to each other, except the mean solute flux with the middle source location, where the method of moments overestimate the solute dispersion and underestimate the solute peak value in comparison with the results of Monte Carlo simulation. Generally speaking, the two methods' results are consistent.

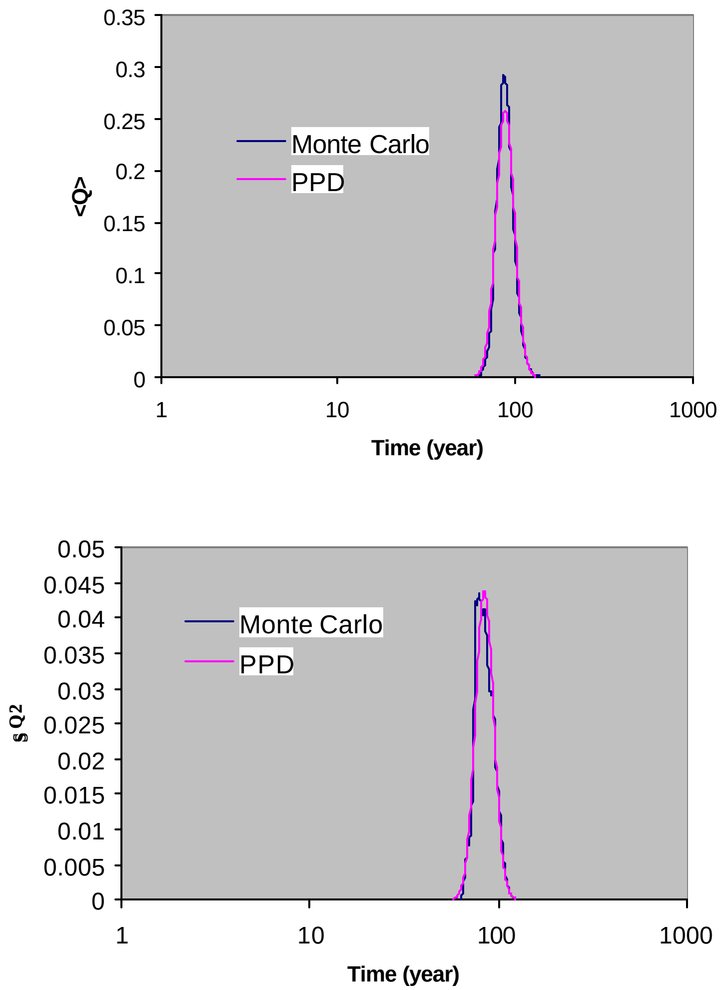



Figure 5-6. Comparison of results by the method of moments and Monte Carlo simulation, for the nonreactive chemical with the upper source location

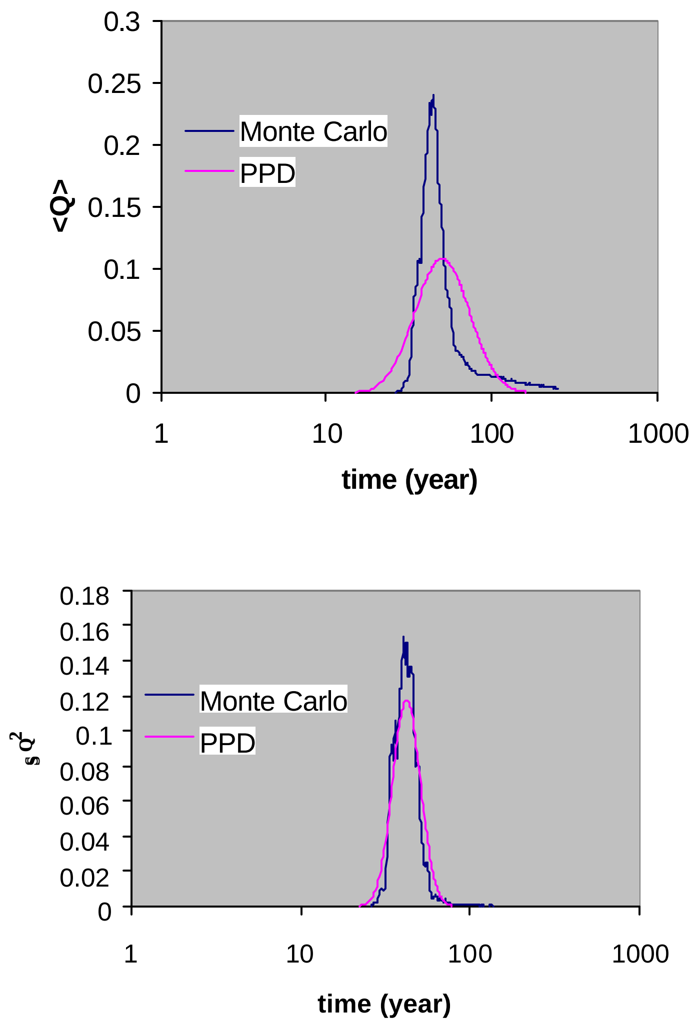
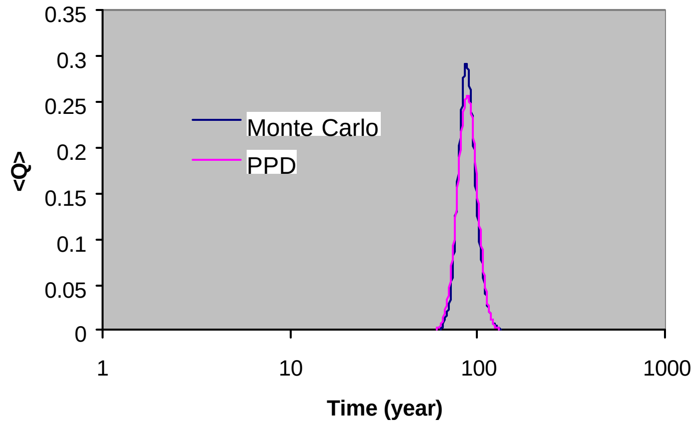



Figure 5-7. Comparison of results by the method of moments and Monte Carlo simulation, for the nonreactive chemical with the middle source location



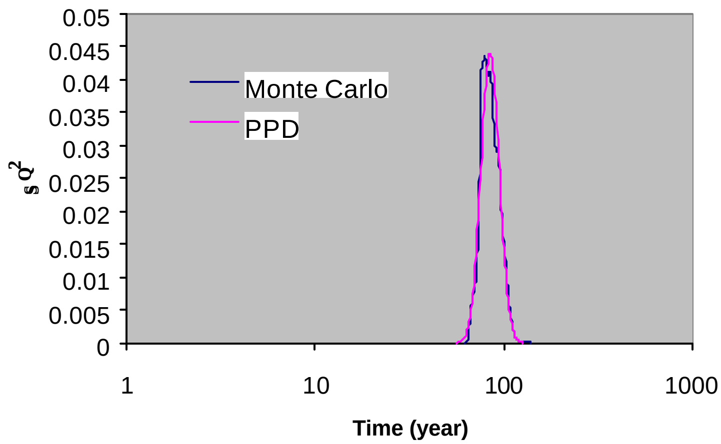




Figure 5-8. Comparison of results by the method of moments and Monte Carlo simulation, for the nonreactive chemical with the lower source location.

# 6. Summary

In this study, a three-dimensional method of moments was set for solute transport in a natural medium with nonstationary distributions of conductivity and sorption coefficient. A numerical code based on the method, NMM3D, was developed and passed the quality assurance review by the DOE Yucca Mountain Project office. The code was then applied to study solute transport in the saturated zone below the Yucca Mountain Project area.

Below the Yucca Mountain Project area, the domain for this study ranges 5,500 m (north-south)$\times$5,000 m (East-West) $\times$ 990 m (vertically). There are seven geological layers in the study domain. The conductivity distribution within each layer is assumed to be stationary and log-normal. The porosity, bulk density and sorption coefficient within each layer are assumed to be constant. According to the previous regional study results, the groundwater flow is assumed to be steady-state. The hydraulic boundary conditions of the study domain are considered as: north and south boundaries are of constant heads, which are 1000m and 736 m, respectively, the other boundaries are assumed to be no-flow. The mean groundwater flow is in the north-south direction. A uniformly distributed, planar contaminant source, 50 m $\times$ 50 m with total 2,500 kg of a solute is perpendicular to the mean flow direction, and put near the north boundary and a control plane is set near the south boundary. Three different vertical locations of the source, upper, middle and lower positions, were used to study the influence of different layers on solute transport processes. Three chemicals with different sorption capacities, nonreactive, weakly sorbed and strongly sorbed, were considered in this study. The NMM3D code was applied to calculate the means, variances and upper bounds of the three chemicals with three different source locations.

From the calculation results of nonreactive solute flux, the mean transport times from the three source locations are about 90 (upper), 50 (middle) and 200 (lower) years, respectively. From the conservative consideration (5 percent of the peak value), the solute will not reach the control plane for 75 years for the upper source case, 20 years for the middle source case, and 40 years for the lower source case. The upper bound results indicate that the uncertainty results will not significantly influence the prediction of solute transport times, but significantly influence the predicted quantity for the upper source case. For the other two cases, the solute flux uncertainty will significant influence both the solute transport time and quantity. It is also shown that different layers play different roles on solute dispersion processes. For the three source locations, the solute will be largest dispersed when the source is in the lower location and least dispersed when the source is in the upper location. The peak values of the mean flux's breakthrough curve are 0.008 kg/year, 0.12 kg/year and 0.28 kg/year for the lower, middle and upper source locations, respectively.

For the weak and strong sorption chemicals, the transport time through the control plane are significantly delayed. The transport times of the solute peak for the weakly sorbed chemical are about 1,100 years, 250 years and 2,500 years for the upper, middle and lower sources, respectively. The weak sorption solute will not reach the control plane for 850 years for the upper source, 100 years for the middle source and 150 years for the lower source. For the strong sorption chemical, the solute flux peak will pass the control plane at about 300,000 years for the upper source, 200,000 years for the middle source, and 1,100,000 years for the lower source, respectively. The strong chemical will not reach the control plane for 200,000 years, 85,000 years and 50,000 years for the source in the upper, middle and lower locations, respectively.

To verify the method of moments, a Monte Carlo simulation was conducted for the nonreactive chemical transport. The software SuperPosV1.0, which had been through the quality assurance review, was applied to generate the conductivity distribution within each zone with the same correlation function and parameter values as the those used in the method of moments. The calculation results indicate that the two methods' results are reasonaly consistent with each other.

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# Appendix

## Appendix A. The input data for the NMM3D [UCCSN Data ID No.: 025XH.001]

| Node | Mean log conductivity | Variance of log conductivity | Lambda X | Lambda Y | Lambda Z | Layer | Porosity | Weak Kd | Stong Kd | Bulk Density |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 2 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 3 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 4 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 5 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 6 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 7 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 8 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 9 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 10 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 11 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 12 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 13 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 14 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 15 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 16 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 17 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 18 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 19 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 20 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 21 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 22 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 23 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 24 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 25 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 26 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 27 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 28 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 29 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 30 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 31 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 32 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 33 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 34 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 35 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 36 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 37 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 38 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 39 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 40 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 41 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 42 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 43 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 44 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 45 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 46 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 47 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 48 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 49 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 50 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 51 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 52 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 53 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 54 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 55 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 56 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 57 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 58 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 59 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 60 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 61 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 62 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 63 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 64 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 65 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 66 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 67 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 68 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 69 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 70 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 71 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 72 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 73 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 74 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 75 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 76 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 77 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 78 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 79 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 80 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 81 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 82 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 83 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 84 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 85 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 86 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 87 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 88 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 89 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 90 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 91 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 93 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 94 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 95 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 96 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 97 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 98 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 99 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 100 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 101 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 102 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 103 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 104 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 105 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 106 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 107 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 108 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 109 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 110 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 111 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 112 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 113 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 114 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 115 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 116 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 117 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 118 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 119 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 120 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 121 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 122 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 123 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 124 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 125 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 126 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 127 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 128 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 129 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 130 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 131 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 132 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 133 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 134 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 135 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 136 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 137 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 138 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 139 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 141 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 142 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 143 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 144 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 145 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 146 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 147 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 148 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 149 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 150 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 151 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 152 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 153 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 154 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 155 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 156 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 157 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 158 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 159 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 160 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 161 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 162 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 163 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 164 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 165 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 166 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 167 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 168 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 169 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 170 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 171 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 172 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 173 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 174 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 175 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 176 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 177 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 178 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 179 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 180 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 181 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 182 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 183 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 184 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 185 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 186 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 187 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 188 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 189 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 190 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 191 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 192 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 193 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 194 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 195 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 196 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 197 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 198 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 199 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 200 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 201 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 202 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 203 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 204 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 205 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 206 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 207 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 208 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 209 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 210 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 211 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 212 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 213 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 214 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 215 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 216 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 217 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 218 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 219 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 220 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 221 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 222 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 223 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 224 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 225 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 226 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 227 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 228 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 229 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 230 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 231 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 232 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 233 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 234 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 235 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 236 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 237 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 238 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 239 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 240 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 241 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 242 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 243 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 244 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 245 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 246 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 247 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 248 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 249 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 250 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 251 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 252 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 253 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 254 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 255 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 256 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 257 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 258 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 259 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 260 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 261 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 262 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 263 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 264 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 265 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 266 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 267 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 268 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 269 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 270 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 271 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 272 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 273 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 274 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 275 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 276 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 277 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 278 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 279 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 280 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 281 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 282 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 283 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 284 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 285 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 286 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 287 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 288 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 289 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 290 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 291 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 292 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 293 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 294 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 295 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 296 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 297 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 298 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 299 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 300 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 301 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 302 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 303 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 304 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 305 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 306 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 307 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 308 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 309 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 310 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 311 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 312 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 313 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 314 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 315 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 316 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 317 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 318 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 319 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 320 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 321 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 322 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 323 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 324 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 325 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 326 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 327 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 328 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 329 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 330 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 331 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 332 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 333 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 334 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 335 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 336 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 337 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 338 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 339 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 340 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 341 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 342 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 343 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 344 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 345 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 346 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 347 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 348 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 349 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 350 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 351 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 352 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 353 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 354 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 355 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 356 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 357 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 358 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 359 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 360 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 361 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 362 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 363 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 364 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 365 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 366 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 367 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 368 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 369 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 370 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 371 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 372 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 373 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 374 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 375 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 376 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 377 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 378 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 379 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 380 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 381 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 382 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 383 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 384 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 385 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 386 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 387 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 388 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 389 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 390 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 391 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 392 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 393 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 394 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 395 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 396 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 397 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 398 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 399 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 400 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 401 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 402 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 403 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 404 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 405 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 406 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 407 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 408 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 409 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 410 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 411 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 412 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 413 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 414 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 415 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 416 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 417 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 418 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 419 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 420 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 421 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 422 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 423 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 424 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 425 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 426 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 427 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 428 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 429 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 430 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 431 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 432 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 433 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 434 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 435 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 436 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 437 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 438 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 439 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 440 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 441 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 442 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 443 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 444 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 445 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 446 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 447 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 448 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 449 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 450 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 451 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 452 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 453 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 454 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 455 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 456 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 457 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 458 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 459 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 460 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 461 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 462 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 463 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 464 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 465 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 466 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 467 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 468 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 469 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 470 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 471 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 472 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 473 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 474 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 475 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 476 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 477 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 478 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 479 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 480 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 481 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 482 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 483 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 484 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 485 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 486 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 487 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 488 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 489 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 490 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 491 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 492 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 493 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 494 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 495 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 496 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 497 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 498 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 499 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 500 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 501 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 502 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 503 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 504 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 505 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 506 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 507 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 508 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 509 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 510 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 511 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 512 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 513 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 514 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 515 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 516 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 517 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 518 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 519 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 520 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 521 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 522 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 523 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 524 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 525 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 526 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 527 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 528 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 529 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 530 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 531 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 532 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 533 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 534 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 535 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 536 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 537 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 538 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 539 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 540 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 541 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 542 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 543 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 544 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 545 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 546 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 547 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 548 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 549 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 550 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 551 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 552 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 553 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 554 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 555 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 556 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 557 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 558 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 559 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 560 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 561 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 562 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 563 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 564 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 565 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 566 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 567 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 568 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 569 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 570 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 571 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 572 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 573 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 574 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 575 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 576 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 577 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 578 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 579 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 580 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 581 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 582 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 583 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 584 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 585 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 586 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 587 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 588 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 589 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 590 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 591 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 592 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 593 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 594 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 595 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 596 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 597 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 598 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 599 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 600 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 601 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 602 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 603 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 604 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 605 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 606 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 607 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 608 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 609 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 610 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 611 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 612 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 613 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 614 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 615 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 616 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 617 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 618 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 619 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 620 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 621 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 622 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 623 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 624 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 625 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 626 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 627 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 628 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 629 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 630 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 631 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 632 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 633 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 634 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 635 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 636 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 637 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 638 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 639 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 640 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 641 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 642 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 643 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 644 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 645 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 646 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 647 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 648 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 649 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 650 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 651 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 652 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 653 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 654 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 655 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 656 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 657 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 658 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 659 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 660 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 661 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 662 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 663 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 664 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 665 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 666 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 667 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 668 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 669 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 670 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 671 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 672 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 673 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 674 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 675 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 676 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 677 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 678 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 679 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 680 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 681 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 682 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 683 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 684 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 685 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 686 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 687 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 688 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 689 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 690 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 691 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 692 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 693 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 694 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 695 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 696 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 697 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 698 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 699 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 700 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 701 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 702 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 703 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 704 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 705 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 706 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 707 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 708 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 709 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 710 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 711 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 712 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 713 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 714 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 715 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 716 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 717 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 718 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 719 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 720 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 721 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 722 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 723 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 724 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 725 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 726 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 727 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 728 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 729 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 730 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 731 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 732 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 733 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 734 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 735 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 736 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 737 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 738 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 739 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 740 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 741 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 742 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 743 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 744 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 745 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 746 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 747 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 748 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 749 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 750 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 751 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 752 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 753 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 754 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 755 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 756 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 757 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 758 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 759 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 760 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 761 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 762 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 763 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 764 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 765 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 766 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 767 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 768 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 769 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 770 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 771 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 772 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 773 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 774 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 775 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 776 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 777 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 778 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 779 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 780 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 781 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 782 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 783 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 784 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 785 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 786 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 787 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 788 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 789 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 790 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 791 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 792 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 793 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 794 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 795 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 796 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 797 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 798 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 799 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 800 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 801 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 802 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 803 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 804 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 805 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 806 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 807 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 808 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 809 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 810 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 811 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 812 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 813 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 814 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 815 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 816 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 817 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 818 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 819 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 820 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 821 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 822 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 823 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 824 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 825 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 826 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 827 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 828 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 829 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 830 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 831 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 832 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 833 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 834 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 835 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 836 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 837 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 838 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 839 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 840 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 841 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 842 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 843 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 844 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 845 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 846 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 847 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 848 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 849 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 850 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 851 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 852 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 853 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 854 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 855 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 856 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 857 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 858 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 859 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 860 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 861 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 862 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 863 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 864 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 865 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 866 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 867 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 868 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 869 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 870 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 871 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 872 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 873 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 874 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 875 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 876 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 877 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 878 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 879 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 880 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 881 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 882 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 883 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 884 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 885 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 886 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 887 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 888 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 889 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 890 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 891 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 892 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 893 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 894 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 895 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 896 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 897 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 898 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 899 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 900 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 901 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 902 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 903 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 904 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 905 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 906 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 907 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 908 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 909 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 910 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 911 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 912 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 913 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 914 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 915 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 916 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 917 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 918 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 919 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 920 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 921 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 922 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 923 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 924 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 925 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 926 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 927 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 928 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 929 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 930 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 931 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 932 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 933 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 934 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 935 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 936 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 937 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 938 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 939 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 940 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 941 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 942 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 943 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 944 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 945 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 946 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 947 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 948 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 949 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 950 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 951 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 952 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 953 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 954 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 955 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 956 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 957 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 958 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 959 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 960 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 961 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 962 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 963 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 964 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 965 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 966 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 967 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 968 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 969 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 970 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 971 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 972 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 973 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 974 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 975 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 976 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 977 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 978 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 979 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 980 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 981 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 982 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 983 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 984 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 985 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 986 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 987 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 988 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 989 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 990 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 991 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 992 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 993 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 994 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 995 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 996 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 997 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 998 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 999 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1000 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1001 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1002 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1003 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1004 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1005 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1006 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1007 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1008 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1009 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1010 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1011 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1012 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1013 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1014 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1015 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1016 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1017 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1018 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1019 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1020 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1021 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 1022 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1023 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1024 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1025 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1026 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1027 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1028 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1029 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1030 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1031 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1032 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1033 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 1034 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1035 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1036 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1037 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1038 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1039 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1040 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1041 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1042 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1043 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1044 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1045 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 1046 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1047 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1048 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1049 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1050 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1051 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1052 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1053 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1054 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1055 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1056 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1057 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1058 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1059 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1060 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1061 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1062 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1063 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1064 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1065 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1066 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1067 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1068 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1069 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1070 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1071 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1072 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1073 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1074 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1075 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1076 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1077 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1078 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1079 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1080 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1081 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1082 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1083 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1084 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1085 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1086 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1087 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1088 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1089 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1090 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1091 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1092 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1093 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1094 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1095 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1096 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1097 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1098 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1099 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1100 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1101 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1102 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1103 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1104 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1105 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1106 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1107 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1108 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1109 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1110 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1111 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1112 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1113 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1114 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1115 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1116 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1117 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1118 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1119 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1120 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1121 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1122 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1123 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1124 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1125 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1126 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1127 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1128 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1129 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1130 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1131 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1132 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1133 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1134 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1135 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1136 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1137 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1138 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1139 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1140 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1141 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1142 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1143 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1144 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1145 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1146 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1147 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1148 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1149 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1150 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1151 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1152 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1153 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1154 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1155 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1156 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1157 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1158 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1159 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1160 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1161 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1162 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1163 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1164 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1165 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 1166 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1167 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1168 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1169 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1170 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1171 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1172 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1173 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1174 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1175 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1176 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1177 | -3.29372 | 1.555195 | 25 | 25 | 25 | 13 | 0.403765 | 18 | 982 | 1.77 |
| 1178 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1179 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1180 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1181 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1182 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1183 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1184 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1185 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1186 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1187 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1188 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1189 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1190 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1191 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1192 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1193 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1194 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1195 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1196 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1197 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1198 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1199 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1200 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1201 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1202 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1203 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1204 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1205 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1206 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1207 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1208 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1209 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1210 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1211 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1212 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1213 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1214 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1215 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1216 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1217 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1218 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1219 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1220 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1221 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1222 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1223 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1224 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1225 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1226 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1227 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1228 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1229 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1230 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1231 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1232 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1233 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1234 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1235 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1236 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1237 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1238 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1239 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1240 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1241 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1242 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1243 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1244 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1245 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1246 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1247 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1248 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1249 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1250 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1251 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1252 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1253 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1254 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1255 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1256 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1257 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1258 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1259 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1260 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1261 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1262 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1263 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1264 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1265 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1266 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1267 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1268 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1269 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1270 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1271 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1272 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1273 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1274 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1275 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1276 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1277 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1278 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1279 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1280 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1281 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1282 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1283 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1284 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1285 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1286 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1287 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1288 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1289 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1290 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1291 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1292 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1293 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1294 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1295 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1296 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1297 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1298 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1299 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1300 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1301 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1302 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1303 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1304 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1305 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1306 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1307 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1308 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1309 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1310 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1311 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1312 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1313 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1314 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1315 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1316 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1317 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1318 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1319 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1320 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1321 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1322 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1323 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1324 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1325 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1326 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1327 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1328 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1329 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1330 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1331 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1332 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1333 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1334 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1335 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1336 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1337 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1338 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1339 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1340 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1341 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1342 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1343 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1344 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1345 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1346 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1347 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1348 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1349 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1350 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1351 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1352 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1353 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1354 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1355 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1356 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1357 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1358 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1359 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1360 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1361 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1362 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1363 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1364 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1365 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1366 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1367 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1368 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1369 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1370 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1371 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1372 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1373 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1374 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1375 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1376 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1377 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1378 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1379 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1380 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1381 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1382 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1383 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1384 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1385 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1386 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1387 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1388 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1389 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1390 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1391 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1392 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1393 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1394 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1395 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1396 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1397 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1398 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1399 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1400 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1401 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1402 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1403 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1404 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1405 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1406 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1407 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1408 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1409 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1410 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1411 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1412 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1413 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1414 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1415 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1416 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1417 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1418 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1419 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1420 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1421 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1422 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1423 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1424 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1425 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1426 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1427 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1428 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1429 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1430 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1431 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1432 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1433 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1434 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1435 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1436 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1437 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1438 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1439 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1440 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1441 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1442 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1443 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1444 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1445 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1446 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1447 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1448 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1449 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1450 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1451 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1452 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1453 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1454 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1455 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1456 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1457 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1458 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1459 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1460 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1461 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1462 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1463 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1464 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1465 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1466 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1467 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1468 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1469 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1470 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1471 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1472 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1473 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1474 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1475 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1476 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1477 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1478 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1479 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1480 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1481 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1482 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1483 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1484 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1485 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1486 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1487 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1488 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1489 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1490 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1491 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1492 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1493 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1494 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1495 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1496 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1497 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1498 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1499 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1500 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1501 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1502 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1503 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1504 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1505 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1506 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1507 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1508 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1509 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1510 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1511 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1512 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1513 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1514 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1515 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1516 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1517 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1518 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1519 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1520 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1521 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1522 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1523 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1524 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1525 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1526 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1527 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1528 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1529 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1530 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1531 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1532 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1533 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1534 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1535 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1536 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1537 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1538 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1539 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1540 | -4.21001 | 2.624794 | 750 | 750 | 75 | 10 | 0.155 | 1 | 480 | 1.94 |
| 1541 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1542 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1543 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1544 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1545 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1546 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1547 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1548 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1549 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1550 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1551 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1552 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1553 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1554 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1555 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1556 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1557 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1558 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1559 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1560 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1561 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1562 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1563 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1564 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1565 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1566 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1567 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1568 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1569 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1570 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1571 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1572 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |
| 1573 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1574 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1575 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1576 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1577 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1578 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |
| 1579 | 0.560673 | 0.215822 | 1000 | 1000 | 100 | 9 | 0.22 | 0.5 | 412.5 | 1.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1580 | 4.738964 | 0.328872 | 1500 | 1500 | 150 | 8 | 0.18 | 0.5 | 478.49 | 1.84 |
| 1581 | 4.084038 | 0.408229 | 1000 | 1000 | 100 | 7 | 0.28 | 0.75 | 1497.06 | 1.77 |
| 1582 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1583 | -0.99114 | 0.144035 | 75 | 75 | 75 | 6 | 0.33 | 0.85 | 423 | 2.08 |
| 1584 | -0.52113 | 1.380128 | 1000 | 1000 | 100 | 5 | 0.16 | 0.65 | 334 | 2.44 |

**Appendix B. Prediction of mean, variance and upper bound of total solute flux for nonreactive solute with source location at upper layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 |
| 5 | 1.67808E-05 | 1.40516E-07 | 0 | 0.000751497 |
| 6 | 5.13699E-06 | 1.31679E-08 | 0 | 0.00023005 |
| 7 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 |
| 12 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 13 | 1.71233E-06 | 1.4631E-09 | 0 | 7.66834E-05 |
| 14 | 3.76712E-06 | 5.90859E-09 | 0 | 0.000154427 |
| 15 | 3.76712E-06 | 7.08142E-09 | 0 | 0.000168703 |
| 16 | 2.73973E-06 | 1.86902E-09 | 0 | 8.74747E-05 |
| 17 | 3.08219E-06 | 3.09849E-09 | 0 | 0.000112184 |
| 18 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 19 | 1.36986E-06 | 5.84537E-10 | 0 | 4.87572E-05 |
| 20 | 7.19178E-06 | 1.15006E-08 | 0 | 0.000217384 |
| 21 | 1.67808E-05 | 6.95603E-08 | 0 | 0.000533717 |
| 22 | 4.00685E-05 | 5.54374E-07 | 0 | 0.001499411 |
| 23 | 5.82192E-05 | 1.12112E-06 | 0 | 0.002133523 |
| 24 | 0.000111986 | 2.78131E-06 | 0 | 0.00338073 |
| 25 | 0.000101027 | 2.17823E-06 | 0 | 0.002993759 |
| 26 | 8.32192E-05 | 1.09876E-06 | 0 | 0.002137724 |
| 27 | 8.86986E-05 | 9.36787E-07 | 0 | 0.001985739 |
| 28 | 8.11644E-05 | 7.25081E-07 | 0 | 0.001750138 |
| 29 | 7.73973E-05 | 7.83323E-07 | 0 | 0.001812106 |
| 30 | 8.35616E-05 | 1.05666E-06 | 0 | 0.002098319 |
| 31 | 8.32192E-05 | 8.93982E-07 | 0 | 0.001936412 |
| 32 | 7.87671E-05 | 6.5445E-07 | 0 | 0.001664369 |
| 33 | 7.94521E-05 | 7.01254E-07 | 0 | 0.001720774 |
| 34 | 8.83562E-05 | 8.43666E-07 | 0 | 0.001888642 |
| 35 | 0.000126712 | 2.84811E-06 | 0 | 0.003434474 |
| 36 | 0.000102055 | 1.06436E-06 | 0 | 0.002124148 |
| 37 | 0.000103425 | 8.53326E-07 | 0 | 0.001913987 |
| 38 | 0.000114041 | 8.4052E-07 | 0 | 0.001910967 |
| 39 | 0.000186644 | 3.08541E-06 | 0 | 0.003629452 |
| 40 | 0.000325 | 2.30346E-05 | 0 | 0.00973189 |
| 41 | 0.000342808 | 2.54973E-05 | 0 | 0.010239807 |
| 42 | 0.000365068 | 3.17354E-05 | 0 | 0.011406567 |
| 43 | 0.000364041 | 3.58083E-05 | 0 | 0.012092682 |
| 44 | 0.000292466 | 1.91444E-05 | 0 | 0.008868308 |
| 45 | 0.000217808 | 6.25487E-06 | 0 | 0.005119716 |
| 46 | 0.000215068 | 4.85147E-06 | 0 | 0.004532177 |
| 47 | 0.00022637 | 4.9012E-06 | 0 | 0.004565545 |
| 48 | 0.000202055 | 3.72301E-06 | 0 | 0.003983897 |
| 49 | 0.00017226 | 2.25928E-06 | 0 | 0.003118314 |

| | | | | |
|---|---|---|---|---|
| 50 | 0.000209589 | 3.33874E-06 | 0 | 0.003790946 |
| 51 | 0.000281164 | 6.5035E-06 | 0 | 0.00527955 |
| 52 | 0.000259932 | 4.6767E-06 | 0 | 0.004498565 |
| 53 | 0.000331507 | 6.99474E-06 | 0 | 0.005515232 |
| 54 | 0.000322603 | 6.63324E-06 | 0 | 0.005370597 |
| 55 | 0.000330137 | 6.64861E-06 | 0 | 0.005383977 |
| 56 | 0.000329795 | 5.94813E-06 | 0 | 0.005109997 |
| 57 | 0.000408219 | 8.65408E-06 | 0 | 0.006174111 |
| 58 | 0.000528082 | 1.60526E-05 | 0 | 0.008380969 |
| 59 | 0.000634589 | 2.64739E-05 | 0 | 0.010719333 |
| 60 | 0.000672603 | 3.12484E-05 | 0 | 0.011629063 |
| 61 | 0.000684589 | 2.91115E-05 | 0 | 0.011259788 |
| 62 | 0.000892808 | 4.25101E-05 | 0 | 0.013671962 |
| 63 | 0.001418493 | 0.000132564 | 0 | 0.023985227 |
| 64 | 0.002525342 | 0.000284046 | 0 | 0.035558507 |
| 65 | 0.005230822 | 0.00145432 | 0 | 0.0799765 |
| 66 | 0.008318151 | 0.003048923 | 0 | 0.116543569 |
| 67 | 0.01195137 | 0.005256419 | 0 | 0.154053652 |
| 68 | 0.015306849 | 0.0066329 | 0 | 0.174934378 |
| 69 | 0.019972945 | 0.007689764 | 0 | 0.1918479 |
| 70 | 0.025944521 | 0.008424466 | 0 | 0.205842909 |
| 71 | 0.032819178 | 0.009206557 | 0 | 0.220882756 |
| 72 | 0.042188356 | 0.011474532 | 0 | 0.252142072 |
| 73 | 0.057168151 | 0.01600752 | 0 | 0.30514898 |
| 74 | 0.076143493 | 0.02329354 | 0 | 0.375283036 |
| 75 | 0.09794589 | 0.033702487 | 0 | 0.457767347 |
| 76 | 0.119923973 | 0.042378064 | 0 | 0.523408266 |
| 77 | 0.139809247 | 0.041796767 | 0 | 0.540516705 |
| 78 | 0.161703082 | 0.042660091 | 0 | 0.56652775 |
| 79 | 0.181761986 | 0.043443722 | 0 | 0.590287882 |
| 80 | 0.201466781 | 0.042866807 | 0 | 0.607271086 |
| 81 | 0.221696575 | 0.041245003 | 0 | 0.619750353 |
| 82 | 0.241242123 | 0.041070729 | 0 | 0.638454055 |
| 83 | 0.258035959 | 0.040408022 | 0 | 0.652030202 |
| 84 | 0.276006849 | 0.041155966 | 0 | 0.67363075 |
| 85 | 0.287357877 | 0.040850627 | 0 | 0.68350403 |
| 86 | 0.291961301 | 0.04001209 | 0 | 0.684020545 |
| 87 | 0.290958219 | 0.036051682 | 0 | 0.663108923 |
| 88 | 0.287613014 | 0.034262756 | 0 | 0.650412971 |
| 89 | 0.282767466 | 0.032315184 | 0 | 0.635105394 |
| 90 | 0.274542466 | 0.029759857 | 0 | 0.612662966 |
| 91 | 0.26420137 | 0.029488843 | 0 | 0.600778765 |
| 92 | 0.250549315 | 0.029154241 | 0 | 0.585211735 |
| 93 | 0.234306507 | 0.028890288 | 0 | 0.56745052 |
| 94 | 0.219157192 | 0.028158341 | 0 | 0.548053963 |
| 95 | 0.203091096 | 0.026314792 | 0 | 0.521039061 |
| 96 | 0.184644863 | 0.023647192 | 0 | 0.48604668 |
| 97 | 0.166926712 | 0.020122066 | 0 | 0.444957163 |
| 98 | 0.151032877 | 0.017847217 | 0 | 0.412876095 |
| 99 | 0.138033904 | 0.016901438 | 0 | 0.392844748 |
| 100 | 0.124959932 | 0.015473093 | 0 | 0.368766078 |
| 101 | 0.113195548 | 0.013969646 | 0 | 0.34485434 |
| 102 | 0.102304795 | 0.01246753 | 0 | 0.321154664 |
| 103 | 0.09119863 | 0.010808395 | 0 | 0.294966961 |
| 104 | 0.08152226 | 0.009698168 | 0 | 0.274541651 |
| 105 | 0.072858219 | 0.008605792 | 0 | 0.254682346 |

| | | | | |
|---|---|---|---|---|
| 106 | 0.065119178 | 0.007464741 | 0 | 0.234460697 |
| 107 | 0.057646918 | 0.006046235 | 0 | 0.210051696 |
| 108 | 0.050942808 | 0.005027057 | 0 | 0.189910229 |
| 109 | 0.045089041 | 0.004050117 | 0 | 0.169824486 |
| 110 | 0.039758219 | 0.003376777 | 0 | 0.153653902 |
| 111 | 0.034530822 | 0.002607259 | 0 | 0.134611025 |
| 112 | 0.030215411 | 0.00210006 | 0 | 0.120035188 |
| 113 | 0.026278767 | 0.001699792 | 0 | 0.107086686 |
| 114 | 0.022835616 | 0.001349493 | 0 | 0.094837081 |
| 115 | 0.01995274 | 0.001069135 | 0 | 0.084040105 |
| 116 | 0.017642123 | 0.000878768 | 0 | 0.075744398 |
| 117 | 0.015344863 | 0.000766239 | 0 | 0.069599685 |
| 118 | 0.01324589 | 0.000573537 | 0 | 0.060185194 |
| 119 | 0.011226712 | 0.000416821 | 0 | 0.051242471 |
| 120 | 0.009777055 | 0.00034038 | 0 | 0.045937879 |
| 121 | 0.008551712 | 0.00028805 | 0 | 0.041816918 |
| 122 | 0.007588014 | 0.000265455 | 0 | 0.039521878 |
| 123 | 0.006430137 | 0.000206853 | 0 | 0.0346196 |
| 124 | 0.005582534 | 0.000166832 | 0 | 0.030898596 |
| 125 | 0.00487911 | 0.000146851 | 0 | 0.02863084 |
| 126 | 0.004181849 | 0.000122657 | 0 | 0.025889006 |
| 127 | 0.003716781 | 0.00010974 | 0 | 0.024249145 |
| 128 | 0.003124658 | 8.24521E-05 | 0 | 0.020922074 |
| 129 | 0.002769521 | 7.86638E-05 | 0 | 0.020153272 |
| 130 | 0.002320205 | 7.45E-05 | 0 | 0.01923763 |
| 131 | 0.002166438 | 9.52813E-05 | 0 | 0.021298421 |
| 132 | 0.001852055 | 0.000100129 | 0 | 0.021464712 |
| 133 | 0.001698288 | 8.81606E-05 | 0 | 0.020101491 |
| 134 | 0.00160274 | 0.000103559 | 0 | 0.021548486 |
| 135 | 0.001359932 | 7.7475E-05 | 0 | 0.018611827 |
| 136 | 0.001225 | 8.12037E-05 | 0 | 0.018887171 |
| 137 | 0.001082534 | 8.22476E-05 | 0 | 0.018857861 |
| 138 | 0.000984247 | 7.71417E-05 | 0 | 0.018198997 |
| 139 | 0.000819863 | 4.34391E-05 | 0 | 0.013737892 |
| 140 | 0.000728425 | 3.6492E-05 | 0 | 0.012568512 |
| 141 | 0.000641781 | 3.02661E-05 | 0 | 0.011424655 |
| 142 | 0.000564384 | 2.95023E-05 | 0 | 0.011210317 |
| 143 | 0.00049863 | 1.98546E-05 | 0 | 0.009232091 |
| 144 | 0.000443836 | 1.75739E-05 | 0 | 0.008660406 |
| 145 | 0.00035411 | 1.05137E-05 | 0 | 0.006709372 |
| 146 | 0.00027911 | 4.62109E-06 | 0 | 0.004492468 |
| 147 | 0.000255479 | 4.12794E-06 | 0 | 0.004237678 |
| 148 | 0.000237671 | 4.17906E-06 | 0 | 0.004244452 |
| 149 | 0.000225685 | 4.28988E-06 | 0 | 0.004285241 |
| 150 | 0.000208219 | 3.2388E-06 | 0 | 0.003735568 |
| 151 | 0.000183219 | 2.31144E-06 | 0 | 0.003163091 |
| 152 | 0.000144521 | 1.33338E-06 | 0 | 0.002407772 |
| 153 | 0.000130479 | 1.13651E-06 | 0 | 0.002219981 |
| 154 | 9.45205E-05 | 4.37913E-07 | 0 | 0.001391551 |
| 155 | 8.25342E-05 | 3.28324E-07 | 0 | 0.001205605 |
| 156 | 6.13014E-05 | 1.53812E-07 | 0 | 0.00082999 |
| 157 | 5.30822E-05 | 1.25079E-07 | 0 | 0.000746266 |
| 158 | 4.10959E-05 | 4.82736E-08 | 0 | 0.000471732 |
| 159 | 4.76027E-05 | 7.63721E-08 | 0 | 0.000589259 |
| 160 | 3.49315E-05 | 3.95942E-08 | 0 | 0.000424938 |
| 161 | 3.49315E-05 | 3.65448E-08 | 0 | 0.000409619 |

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|---|---|---|---|---|
| 162 | 2.56849E-05 | 2.40283E-08 | 0 | 0.000329506 |
| 163 | 2.05479E-05 | 1.95159E-08 | 0 | 0.000294358 |
| 164 | 1.95205E-05 | 1.63317E-08 | 0 | 0.00027 |
| 165 | 1.71233E-05 | 1.3077E-08 | 0 | 0.000241259 |
| 166 | 1.5411E-05 | 1.34259E-08 | 0 | 0.000242517 |
| 167 | 1.36986E-05 | 1.01332E-08 | 0 | 0.000211 |
| 168 | 1.43836E-05 | 9.4103E-09 | 0 | 0.000204517 |
| 169 | 1.30137E-05 | 8.62685E-09 | 0 | 0.00019506 |
| 170 | 9.58904E-06 | 4.24751E-09 | 0 | 0.000137328 |
| 171 | 7.87671E-06 | 4.33606E-09 | 0 | 0.00013694 |
| 172 | 1.19863E-05 | 1.25815E-08 | 0 | 0.000231834 |
| 173 | 6.16438E-06 | 3.71505E-09 | 0 | 0.000125629 |
| 174 | 6.50685E-06 | 3.30022E-09 | 0 | 0.000119104 |
| 175 | 6.50685E-06 | 4.00392E-09 | 0 | 0.000130529 |
| 176 | 6.50685E-06 | 5.64588E-09 | 0 | 0.000153779 |
| 177 | 9.93151E-06 | 1.82561E-08 | 0 | 0.000274757 |
| 178 | 7.53425E-06 | 6.27651E-09 | 0 | 0.000162814 |
| 179 | 6.16438E-06 | 6.06071E-09 | 0 | 0.000158751 |
| 180 | 9.24658E-06 | 1.62755E-08 | 0 | 0.000259294 |
| 181 | 5.13699E-06 | 3.7853E-09 | 0 | 0.000125726 |
| 182 | 3.42466E-06 | 1.8648E-09 | 0 | 8.80639E-05 |
| 183 | 4.79452E-06 | 2.7918E-09 | 0 | 0.000108356 |
| 184 | 4.45205E-06 | 2.38448E-09 | 0 | 0.000100161 |
| 185 | 4.10959E-06 | 2.21148E-09 | 0 | 9.62814E-05 |
| 186 | 4.10959E-06 | 1.62507E-09 | 0 | 8.31214E-05 |
| 187 | 4.45205E-06 | 2.61904E-09 | 0 | 0.000104758 |
| 188 | 2.73973E-06 | 8.13473E-10 | 0 | 5.86418E-05 |
| 189 | 2.05479E-06 | 5.82192E-10 | 0 | 4.9347E-05 |
| 190 | 2.73973E-06 | 8.13473E-10 | 0 | 5.86418E-05 |
| 191 | 1.71233E-06 | 2.90275E-10 | 0 | 3.51057E-05 |
| 192 | 2.39726E-06 | 2.16399E-09 | 0 | 9.35738E-05 |
| 193 | 1.36986E-06 | 5.84537E-10 | 0 | 4.87572E-05 |
| 194 | 2.39726E-06 | 2.16399E-09 | 0 | 9.35738E-05 |
| 195 | 3.08219E-06 | 1.80838E-09 | 0 | 8.64314E-05 |
| 196 | 6.84932E-07 | 1.16814E-10 | 0 | 2.18687E-05 |
| 197 | 1.0274E-06 | 2.92151E-10 | 0 | 3.45286E-05 |
| 198 | 0 | 0 | 0 | 0 |
| 199 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 200 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 201 | 6.84932E-07 | 1.16814E-10 | 0 | 2.18687E-05 |
| 202 | 1.0274E-06 | 2.92151E-10 | 0 | 3.45286E-05 |
| 203 | 1.0274E-06 | 2.92151E-10 | 0 | 3.45286E-05 |
| 204 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 205 | 0 | 0 | 0 | 0 |
| 206 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 207 | 0 | 0 | 0 | 0 |
| 208 | 0 | 0 | 0 | 0 |
| 209 | 0 | 0 | 0 | 0 |
| 210 | 0 | 0 | 0 | 0 |
| 211 | 0 | 0 | 0 | 0 |
| 212 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 213 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 214 | 0 | 0 | 0 | 0 |
| 215 | 0 | 0 | 0 | 0 |
| 216 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 217 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |

| | | | | |
|---|---|---|---|---|
| 218 | 0 | 0 | 0 | 0 |
| 219 | 0 | 0 | 0 | 0 |
| 220 | 0 | 0 | 0 | 0 |
| 221 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 222 | 0 | 0 | 0 | 0 |
| 223 | 0 | 0 | 0 | 0 |
| 224 | 0 | 0 | 0 | 0 |
| 225 | 0 | 0 | 0 | 0 |
| 226 | 0 | 0 | 0 | 0 |
| 227 | 0 | 0 | 0 | 0 |
| 228 | 0 | 0 | 0 | 0 |
| 229 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 230 | 0 | 0 | 0 | 0 |
| 231 | 0 | 0 | 0 | 0 |
| 232 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 233 | 0 | 0 | 0 | 0 |
| 234 | 0 | 0 | 0 | 0 |
| 235 | 0 | 0 | 0 | 0 |
| 236 | 0 | 0 | 0 | 0 |
| 237 | 0 | 0 | 0 | 0 |
| 238 | 0 | 0 | 0 | 0 |
| 239 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 240 | 0 | 0 | 0 | 0 |
| 241 | 0 | 0 | 0 | 0 |
| 242 | 0 | 0 | 0 | 0 |
| 243 | 0 | 0 | 0 | 0 |
| 244 | 0 | 0 | 0 | 0 |
| 245 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 246 | 0 | 0 | 0 | 0 |
| 247 | 0 | 0 | 0 | 0 |
| 248 | 0 | 0 | 0 | 0 |
| 249 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |
| 250 | 3.42466E-07 | 5.8524E-11 | 0 | 1.53367E-05 |

**Appendix C. Prediction of mean, variance and upper bound of total solute flux for weak-sorption solute with source location at upper layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 20 | 0 | 0 | 0 | 0 |
| 40 | 1.09589E-06 | 5.99287E-10 | 0 | 4.90774E-05 |
| 60 | 0 | 0 | 0 | 0 |
| 80 | 3.93836E-07 | 6.5083E-11 | 0 | 1.6206E-05 |
| 100 | 3.42466E-07 | 3.9759E-11 | 0 | 1.27012E-05 |
| 120 | 5.13699E-08 | 7.3E-13 | 0 | 1.72643E-06 |
| 140 | 1.79795E-06 | 1.55267E-09 | 0 | 7.90297E-05 |
| 160 | 4.31507E-06 | 8.92742E-09 | 0 | 0.000189506 |
| 180 | 6.50685E-07 | 1.32399E-10 | 0 | 2.32034E-05 |
| 200 | 2.91096E-07 | 2.9969E-11 | 0 | 1.10209E-05 |
| 220 | 3.76712E-07 | 5.4101E-11 | 0 | 1.47932E-05 |
| 240 | 1.19863E-07 | 3.651E-12 | 0 | 3.86481E-06 |
| 260 | 2.05479E-07 | 5.822E-12 | 0 | 4.9347E-06 |
| 280 | 2.91096E-07 | 1.6775E-11 | 0 | 8.31865E-06 |
| 300 | 3.59589E-07 | 2.0835E-11 | 0 | 9.30608E-06 |
| 320 | 1.71233E-07 | 6.421E-12 | 0 | 5.1379E-06 |
| 340 | 2.73973E-07 | 1.2533E-11 | 0 | 7.21272E-06 |
| 360 | 3.08219E-07 | 1.3393E-11 | 0 | 7.481E-06 |
| 380 | 4.96575E-07 | 3.4792E-11 | 0 | 1.20575E-05 |
| 400 | 8.56164E-07 | 1.05701E-10 | 0 | 2.10071E-05 |
| 420 | 1.04452E-06 | 1.75273E-10 | 0 | 2.69931E-05 |
| 440 | 1.04452E-06 | 1.9697E-10 | 0 | 2.85524E-05 |
| 460 | 1.78082E-06 | 5.03784E-10 | 0 | 4.57733E-05 |
| 480 | 1.57534E-06 | 3.85138E-10 | 0 | 4.00402E-05 |
| 500 | 2.44863E-06 | 7.85516E-10 | 0 | 5.73817E-05 |
| 520 | 2.00342E-06 | 5.81081E-10 | 0 | 4.92504E-05 |
| 540 | 2.58562E-06 | 7.20321E-10 | 0 | 5.51897E-05 |
| 560 | 5.20548E-06 | 2.52117E-09 | 0 | 0.000103619 |
| 580 | 6.78082E-06 | 3.93313E-09 | 0 | 0.000129702 |
| 600 | 1.18151E-05 | 1.24343E-08 | 0 | 0.000230373 |
| 620 | 2.56164E-05 | 6.18843E-08 | 0 | 0.000513197 |
| 640 | 3.97089E-05 | 1.68986E-07 | 0 | 0.000845423 |
| 660 | 6.64897E-05 | 5.80042E-07 | 0 | 0.001559235 |
| 680 | 6.69863E-05 | 6.0714E-07 | 0 | 0.001594202 |
| 700 | 6.10274E-05 | 3.46431E-07 | 0 | 0.001214652 |
| 720 | 7.27568E-05 | 4.11261E-07 | 0 | 0.001329698 |
| 740 | 8.01027E-05 | 3.17257E-07 | 0 | 0.001184084 |
| 760 | 0.000133288 | 6.16767E-07 | 0 | 0.001672564 |
| 780 | 0.000180428 | 1.14019E-06 | 0 | 0.002273307 |
| 800 | 0.000248836 | 1.80375E-06 | 0 | 0.002881188 |
| 820 | 0.000427414 | 3.47443E-06 | 0 | 0.004080821 |
| 840 | 0.000760171 | 8.24775E-06 | 0 | 0.006389075 |
| 860 | 0.001189144 | 1.44953E-05 | 0 | 0.008651391 |
| 880 | 0.001692825 | 2.20059E-05 | 0 | 0.010887276 |
| 900 | 0.002392089 | 3.29198E-05 | 0 | 0.013637737 |
| 920 | 0.003190822 | 4.34441E-05 | 0 | 0.0161096 |
| 940 | 0.004230325 | 6.2819E-05 | 0 | 0.019764979 |
| 960 | 0.005227003 | 7.0569E-05 | 0 | 0.021692054 |
| 980 | 0.006208801 | 7.40159E-05 | 0 | 0.023071165 |

| | | | | |
|---|---|---|---|---|
| 1000 | 0.007322894 | 7.40587E-05 | 0 | 0.024190136 |
| 1020 | 0.008591901 | 8.06987E-05 | 0 | 0.026199065 |
| 1040 | 0.00962161 | 8.05588E-05 | 0 | 0.027213502 |
| 1060 | 0.010732449 | 8.16707E-05 | 0 | 0.028445327 |
| 1080 | 0.011589914 | 7.93505E-05 | 0 | 0.029049375 |
| 1100 | 0.012303082 | 7.39833E-05 | 0 | 0.029161742 |
| 1120 | 0.012909195 | 7.07418E-05 | 0 | 0.029394394 |
| 1140 | 0.013604555 | 7.30417E-05 | 0 | 0.030355585 |
| 1160 | 0.014011866 | 6.87541E-05 | 0 | 0.03026381 |
| 1180 | 0.014026901 | 5.94494E-05 | 0 | 0.02913917 |
| 1200 | 0.013904161 | 5.07314E-05 | 0 | 0.027864448 |
| 1220 | 0.013603733 | 4.93682E-05 | 0 | 0.027375186 |
| 1240 | 0.013257277 | 4.51613E-05 | 0 | 0.026428895 |
| 1260 | 0.012839384 | 4.28301E-05 | 0 | 0.025666552 |
| 1280 | 0.012268408 | 3.98936E-05 | 0 | 0.024648042 |
| 1300 | 0.011596901 | 3.67404E-05 | 0 | 0.023477224 |
| 1320 | 0.01091762 | 3.57475E-05 | 0 | 0.0226363 |
| 1340 | 0.010289092 | 3.59695E-05 | 0 | 0.022044105 |
| 1360 | 0.009602175 | 3.55864E-05 | 0 | 0.021294417 |
| 1380 | 0.00899262 | 3.54361E-05 | 0 | 0.020660161 |
| 1400 | 0.008405582 | 3.47805E-05 | 0 | 0.019964688 |
| 1420 | 0.007752842 | 3.3612E-05 | 0 | 0.019116108 |
| 1440 | 0.007055274 | 3.01391E-05 | 0 | 0.017815488 |
| 1460 | 0.006458476 | 2.78357E-05 | 0 | 0.016799348 |
| 1480 | 0.005811387 | 2.56884E-05 | 0 | 0.015745394 |
| 1500 | 0.005246747 | 2.27533E-05 | 0 | 0.014596029 |
| 1520 | 0.004755753 | 2.05806E-05 | 0 | 0.013647457 |
| 1540 | 0.00423089 | 1.76541E-05 | 0 | 0.012466173 |
| 1560 | 0.003820702 | 1.57353E-05 | 0 | 0.011595579 |
| 1580 | 0.003463236 | 1.38977E-05 | 0 | 0.010770038 |
| 1600 | 0.003106387 | 1.20257E-05 | 0 | 0.009903293 |
| 1620 | 0.002821558 | 1.08488E-05 | 0 | 0.009277311 |
| 1640 | 0.002516541 | 9.4818E-06 | 0 | 0.008551878 |
| 1660 | 0.002232329 | 7.99157E-06 | 0 | 0.007773126 |
| 1680 | 0.00200125 | 6.92865E-06 | 0 | 0.007160426 |
| 1700 | 0.001763065 | 5.91207E-06 | 0 | 0.006528756 |
| 1720 | 0.001538545 | 4.75115E-06 | 0 | 0.005810785 |
| 1740 | 0.001337997 | 3.65108E-06 | 0 | 0.005083125 |
| 1760 | 0.001162534 | 2.97828E-06 | 0 | 0.004545043 |
| 1780 | 0.001018784 | 2.53835E-06 | 0 | 0.004141495 |
| 1800 | 0.000900925 | 2.07367E-06 | 0 | 0.003723372 |
| 1820 | 0.000803236 | 1.80626E-06 | 0 | 0.003437419 |
| 1840 | 0.000700257 | 1.61347E-06 | 0 | 0.003189895 |
| 1860 | 0.000630068 | 1.56285E-06 | 0 | 0.003080342 |
| 1880 | 0.000576438 | 1.51094E-06 | 0 | 0.002985674 |
| 1900 | 0.000508562 | 1.20635E-06 | 0 | 0.002661308 |
| 1920 | 0.000425274 | 7.44312E-07 | 0 | 0.002116234 |
| 1940 | 0.000371678 | 5.90708E-07 | 0 | 0.001878086 |
| 1960 | 0.000322021 | 4.73766E-07 | 0 | 0.001671101 |
| 1980 | 0.000288733 | 4.54896E-07 | 0 | 0.001610674 |
| 2000 | 0.000246986 | 3.11921E-07 | 0 | 0.001341644 |
| 2020 | 0.000218545 | 2.37789E-07 | 0 | 0.001174312 |
| 2040 | 0.000192791 | 1.93597E-07 | 0 | 0.001055184 |
| 2060 | 0.000169281 | 1.56743E-07 | 0 | 0.000945261 |
| 2080 | 0.000150531 | 1.3249E-07 | 0 | 0.000863955 |
| 2100 | 0.000132226 | 1.01635E-07 | 0 | 0.00075708 |

| | | | | |
|---|---|---|---|---|
| 2120 | 0.000111884 | 7.69996E-08 | 0 | 0.00065576 |
| 2140 | 9.80479E-05 | 5.98555E-08 | 0 | 0.00057757 |
| 2160 | 8.55137E-05 | 4.68979E-08 | 0 | 0.00050997 |
| 2180 | 7.53596E-05 | 3.63309E-08 | 0 | 0.000448949 |
| 2200 | 6.55308E-05 | 2.89995E-08 | 0 | 0.000399304 |
| 2220 | 5.83219E-05 | 2.47652E-08 | 0 | 0.000366766 |
| 2240 | 5.42808E-05 | 2.18108E-08 | 0 | 0.000343743 |
| 2260 | 4.91781E-05 | 2.01391E-08 | 0 | 0.000327326 |
| 2280 | 4.43151E-05 | 2.28872E-08 | 0 | 0.000340834 |
| 2300 | 3.78596E-05 | 1.55491E-08 | 0 | 0.000282263 |
| 2320 | 3.3339E-05 | 1.15816E-08 | 0 | 0.00024427 |
| 2340 | 3.11986E-05 | 1.00706E-08 | 0 | 0.000227889 |
| 2360 | 2.77911E-05 | 9.24023E-09 | 0 | 0.000216198 |
| 2380 | 0.00002375 | 6.5575E-09 | 0 | 0.000182468 |
| 2400 | 2.0976E-05 | 5.73363E-09 | 0 | 0.000169389 |
| 2420 | 1.82192E-05 | 4.4963E-09 | 0 | 0.000149646 |
| 2440 | 1.54795E-05 | 3.9553E-09 | 0 | 0.000138746 |
| 2460 | 1.42123E-05 | 4.06857E-09 | 0 | 0.000139232 |
| 2480 | 1.26712E-05 | 3.46993E-09 | 0 | 0.000128127 |
| 2500 | 1.05308E-05 | 2.29648E-09 | 0 | 0.000104457 |
| 2520 | 9.86301E-06 | 2.07128E-09 | 0 | 9.90652E-05 |
| 2540 | 8.88699E-06 | 1.78039E-09 | 0 | 9.15886E-05 |
| 2560 | 7.77397E-06 | 1.53813E-09 | 0 | 8.46432E-05 |
| 2580 | 7.58562E-06 | 1.43708E-09 | 0 | 8.1887E-05 |
| 2600 | 6.83219E-06 | 1.09463E-09 | 0 | 7.16792E-05 |
| 2620 | 5.7363E-06 | 7.91739E-10 | 0 | 6.08865E-05 |
| 2640 | 5.61644E-06 | 7.72722E-10 | 0 | 6.01003E-05 |
| 2660 | 4.33219E-06 | 5.8949E-10 | 0 | 5.19198E-05 |
| 2680 | 4.24658E-06 | 4.83937E-10 | 0 | 4.73638E-05 |
| 2700 | 3.80137E-06 | 3.70824E-10 | 0 | 4.15447E-05 |
| 2720 | 3.76712E-06 | 4.66961E-10 | 0 | 4.61213E-05 |
| 2740 | 3.08219E-06 | 2.7667E-10 | 0 | 3.56837E-05 |
| 2760 | 2.82534E-06 | 2.8801E-10 | 0 | 3.60882E-05 |
| 2780 | 2.75685E-06 | 2.19195E-10 | 0 | 3.17751E-05 |
| 2800 | 3.04795E-06 | 3.40213E-10 | 0 | 3.91999E-05 |
| 2820 | 2.94521E-06 | 3.87155E-10 | 0 | 4.15107E-05 |
| 2840 | 2.2089E-06 | 1.84093E-10 | 0 | 2.88023E-05 |
| 2860 | 2.39726E-06 | 2.64883E-10 | 0 | 3.42967E-05 |
| 2880 | 2.08904E-06 | 2.93827E-10 | 0 | 3.56862E-05 |
| 2900 | 2.10616E-06 | 2.93316E-10 | 0 | 3.5674E-05 |
| 2920 | 1.52397E-06 | 1.40029E-10 | 0 | 2.47174E-05 |
| 2940 | 9.41781E-07 | 2.7701E-11 | 0 | 1.12576E-05 |
| 2960 | 1.07877E-06 | 3.622E-11 | 0 | 1.28747E-05 |
| 2980 | 1.14726E-06 | 3.7534E-11 | 0 | 1.31552E-05 |
| 3000 | 8.39041E-07 | 3.0816E-11 | 0 | 1.17194E-05 |
| 3020 | 8.90411E-07 | 3.1167E-11 | 0 | 1.18325E-05 |
| 3040 | 7.36301E-07 | 2.5407E-11 | 0 | 1.06157E-05 |
| 3060 | 7.02055E-07 | 1.9885E-11 | 0 | 9.44221E-06 |
| 3080 | 6.84932E-07 | 2.504E-11 | 0 | 1.04927E-05 |
| 3100 | 7.87671E-07 | 4.424E-11 | 0 | 1.38243E-05 |
| 3120 | 5.47945E-07 | 1.5826E-11 | 0 | 8.34523E-06 |
| 3140 | 6.33562E-07 | 4.4019E-11 | 0 | 1.36376E-05 |
| 3160 | 5.65068E-07 | 1.9472E-11 | 0 | 9.21402E-06 |
| 3180 | 5.82192E-07 | 3.3087E-11 | 0 | 1.18563E-05 |
| 3200 | 5.82192E-07 | 1.9892E-11 | 0 | 9.32395E-06 |
| 3220 | 4.45205E-07 | 1.241E-11 | 0 | 7.34977E-06 |

| | | | | |
|---|---|---|---|---|
| 3240 | 4.28082E-07 | 1.1985E-11 | 0 | 7.21343E-06 |
| 3260 | 1.88356E-07 | 2.457E-12 | 0 | 3.26048E-06 |
| 3280 | 2.56849E-07 | 3.306E-12 | 0 | 3.82055E-06 |
| 3300 | 2.22603E-07 | 4.788E-12 | 0 | 4.51154E-06 |
| 3320 | 2.73973E-07 | 5.789E-12 | 0 | 4.98983E-06 |
| 3340 | 3.93836E-07 | 6.442E-12 | 0 | 5.36855E-06 |
| 3360 | 2.39726E-07 | 3.461E-12 | 0 | 3.88607E-06 |
| 3380 | 3.42466E-07 | 6.333E-12 | 0 | 5.275E-06 |
| 3400 | 1.71233E-07 | 3.489E-12 | 0 | 3.83238E-06 |
| 3420 | 2.91096E-07 | 4.753E-12 | 0 | 4.56425E-06 |
| 3440 | 2.22603E-07 | 3.909E-12 | 0 | 4.09763E-06 |
| 3460 | 2.56849E-07 | 6.824E-12 | 0 | 5.37706E-06 |
| 3480 | 1.5411E-07 | 2.175E-12 | 0 | 3.0449E-06 |
| 3500 | 1.5411E-07 | 1.589E-12 | 0 | 2.62471E-06 |
| 3520 | 1.5411E-07 | 3.348E-12 | 0 | 3.7405E-06 |
| 3540 | 1.71233E-07 | 3.782E-12 | 0 | 3.9831E-06 |
| 3560 | 1.0274E-07 | 1.162E-12 | 0 | 2.21579E-06 |
| 3580 | 1.19863E-07 | 2.771E-12 | 0 | 3.3826E-06 |
| 3600 | 1.19863E-07 | 1.598E-12 | 0 | 2.59775E-06 |
| 3620 | 1.5411E-07 | 1.589E-12 | 0 | 2.62471E-06 |
| 3640 | 1.88356E-07 | 4.216E-12 | 0 | 4.21282E-06 |
| 3660 | 1.71233E-07 | 7.887E-12 | 0 | 5.67575E-06 |
| 3680 | 2.73973E-07 | 4.909E-12 | 0 | 4.6168E-06 |
| 3700 | 1.88356E-07 | 7.735E-12 | 0 | 5.63931E-06 |
| 3720 | 2.56849E-07 | 1.8259E-11 | 0 | 8.63214E-06 |
| 3740 | 1.71233E-07 | 6.128E-12 | 0 | 5.02318E-06 |
| 3760 | 1.5411E-07 | 7.453E-12 | 0 | 5.50496E-06 |
| 3780 | 5.13699E-08 | 1.317E-12 | 0 | 2.3005E-06 |
| 3800 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 3820 | 0 | 0 | 0 | 0 |
| 3840 | 6.84932E-08 | 8.75E-13 | 0 | 1.90183E-06 |
| 3860 | 0 | 0 | 0 | 0 |
| 3880 | 3.42466E-08 | 2.92E-13 | 0 | 1.09343E-06 |
| 3900 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 3920 | 3.42466E-08 | 2.92E-13 | 0 | 1.09343E-06 |
| 3940 | 0 | 0 | 0 | 0 |
| 3960 | 3.42466E-08 | 2.92E-13 | 0 | 1.09343E-06 |
| 3980 | 0 | 0 | 0 | 0 |
| 4000 | 3.42466E-08 | 5.85E-13 | 0 | 1.53367E-06 |
| 4020 | 0 | 0 | 0 | 0 |
| 4040 | 0 | 0 | 0 | 0 |
| 4060 | 0 | 0 | 0 | 0 |
| 4080 | 0 | 0 | 0 | 0 |
| 4100 | 3.42466E-08 | 2.92E-13 | 0 | 1.09343E-06 |
| 4120 | 0 | 0 | 0 | 0 |
| 4140 | 0 | 0 | 0 | 0 |
| 4160 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4180 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4200 | 0 | 0 | 0 | 0 |
| 4220 | 0 | 0 | 0 | 0 |
| 4240 | 0 | 0 | 0 | 0 |
| 4260 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4280 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4300 | 0 | 0 | 0 | 0 |
| 4320 | 0 | 0 | 0 | 0 |
| 4340 | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| 4360 | 0 | 0 | 0 | 0 |
| 4380 | 0 | 0 | 0 | 0 |
| 4400 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4420 | 0 | 0 | 0 | 0 |
| 4440 | 0 | 0 | 0 | 0 |
| 4460 | 0 | 0 | 0 | 0 |
| 4480 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4500 | 0 | 0 | 0 | 0 |
| 4520 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4540 | 0 | 0 | 0 | 0 |
| 4560 | 0 | 0 | 0 | 0 |
| 4580 | 0 | 0 | 0 | 0 |
| 4600 | 0 | 0 | 0 | 0 |
| 4620 | 1.71233E-08 | 1.46E-13 | 0 | 7.66834E-07 |
| 4640 | 0 | 0 | 0 | 0 |
| 4660 | 0 | 0 | 0 | 0 |
| 4680 | 0 | 0 | 0 | 0 |
| 4700 | 0 | 0 | 0 | 0 |
| 4720 | 0 | 0 | 0 | 0 |
| 4740 | 0 | 0 | 0 | 0 |
| 4760 | 0 | 0 | 0 | 0 |
| 4780 | 0 | 0 | 0 | 0 |
| 4800 | 0 | 0 | 0 | 0 |
| 4820 | 0 | 0 | 0 | 0 |
| 4840 | 0 | 0 | 0 | 0 |
| 4860 | 0 | 0 | 0 | 0 |
| 4880 | 0 | 0 | 0 | 0 |
| 4900 | 0 | 0 | 0 | 0 |
| 4920 | 0 | 0 | 0 | 0 |
| 4940 | 0 | 0 | 0 | 0 |
| 4960 | 0 | 0 | 0 | 0 |
| 4980 | 0 | 0 | 0 | 0 |
| 5000 | 0 | 0 | 0 | 0 |

**Appendix D. Prediction of mean, variance and upper bound of total solute flux for strong-sorption solute with source location at upper layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 2400 | 0 | 0 | 0 | 0 |
| 4800 | 0 | 0 | 0 | 0 |
| 7200 | 0 | 0 | 0 | 0 |
| 9600 | 0 | 0 | 0 | 0 |
| 12000 | 0 | 0 | 0 | 0 |
| 14400 | 0 | 0 | 0 | 0 |
| 16800 | 0 | 0 | 0 | 0 |
| 19200 | 0 | 0 | 0 | 0 |
| 21600 | 0 | 0 | 0 | 0 |
| 24000 | 0 | 0 | 0 | 0 |
| 26400 | 0 | 0 | 0 | 0 |
| 28800 | 0 | 0 | 0 | 0 |
| 31200 | 6.27854E-09 | 2E-14 | 0 | 2.81172E-07 |
| 33600 | 2.71119E-09 | 4E-15 | 0 | 1.21415E-07 |
| 36000 | 1.42694E-10 | 0 | 0 | 6.39028E-09 |
| 38400 | 0 | 0 | 0 | 0 |
| 40800 | 0 | 0 | 0 | 0 |
| 43200 | 0 | 0 | 0 | 0 |
| 45600 | 0 | 0 | 0 | 0 |
| 48000 | 0 | 0 | 0 | 0 |
| 50400 | 0 | 0 | 0 | 0 |
| 52800 | 0 | 0 | 0 | 0 |
| 55200 | 1.42694E-10 | 0 | 0 | 6.39028E-09 |
| 57600 | 0 | 0 | 0 | 0 |
| 60000 | 0 | 0 | 0 | 0 |
| 62400 | 0 | 0 | 0 | 0 |
| 64800 | 0 | 0 | 0 | 0 |
| 67200 | 0 | 0 | 0 | 0 |
| 69600 | 0 | 0 | 0 | 0 |
| 72000 | 0 | 0 | 0 | 0 |
| 74400 | 0 | 0 | 0 | 0 |
| 76800 | 5.70776E-10 | 0 | 0 | 2.55611E-08 |
| 79200 | 1.42694E-10 | 0 | 0 | 6.39028E-09 |
| 81600 | 2.85388E-10 | 0 | 0 | 1.27806E-08 |
| 84000 | 4.28082E-10 | 0 | 0 | 1.43869E-08 |
| 86400 | 1.14155E-09 | 0 | 0 | 4.0631E-08 |
| 88800 | 2.14041E-09 | 1E-15 | 0 | 5.4669E-08 |
| 91200 | 2.99658E-09 | 2E-15 | 0 | 8.92266E-08 |
| 93600 | 1.85502E-09 | 1E-15 | 0 | 4.72383E-08 |
| 96000 | 3.42466E-09 | 2E-15 | 0 | 9.29329E-08 |
| 98400 | 5.42237E-09 | 4E-15 | 0 | 1.35873E-07 |
| 100800 | 8.70434E-09 | 1.7E-14 | 0 | 2.67432E-07 |
| 103200 | 1.01313E-08 | 2.8E-14 | 0 | 3.36587E-07 |
| 105600 | 1.76941E-08 | 9.3E-14 | 0 | 6.14117E-07 |
| 108000 | 1.62671E-08 | 8.2E-14 | 0 | 5.76885E-07 |
| 110400 | 1.52683E-08 | 6.4E-14 | 0 | 5.12049E-07 |
| 112800 | 1.96918E-08 | 1.28E-13 | 0 | 7.21904E-07 |
| 115200 | 1.94064E-08 | 8.7E-14 | 0 | 5.96694E-07 |
| 117600 | 2.26884E-08 | 9.6E-14 | 0 | 6.30645E-07 |

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|---|---|---|---|---|
| 120000 | 2.81107E-08 | 1.06E-13 | 0 | 6.66842E-07 |
| 122400 | 2.754E-08 | 9.8E-14 | 0 | 6.42026E-07 |
| 124800 | 2.29737E-08 | 6.9E-14 | 0 | 5.38647E-07 |
| 127200 | 2.63984E-08 | 9.6E-14 | 0 | 6.32749E-07 |
| 129600 | 2.81107E-08 | 9.7E-14 | 0 | 6.39498E-07 |
| 132000 | 2.71119E-08 | 9.6E-14 | 0 | 6.32986E-07 |
| 134400 | 2.34018E-08 | 5.8E-14 | 0 | 4.95234E-07 |
| 136800 | 2.38299E-08 | 4.9E-14 | 0 | 4.59774E-07 |
| 139200 | 2.48288E-08 | 5.9E-14 | 0 | 4.99522E-07 |
| 141600 | 3.09646E-08 | 7.4E-14 | 0 | 5.63857E-07 |
| 144000 | 2.41153E-08 | 4.3E-14 | 0 | 4.32577E-07 |
| 146400 | 2.92523E-08 | 7E-14 | 0 | 5.49298E-07 |
| 148800 | 3.72432E-08 | 1.92E-13 | 0 | 8.95246E-07 |
| 151200 | 4.95148E-08 | 3.81E-13 | 0 | 1.25924E-06 |
| 153600 | 6.59247E-08 | 9.43E-13 | 0 | 1.96889E-06 |
| 156000 | 8.47603E-08 | 1.785E-12 | 0 | 2.70368E-06 |
| 158400 | 8.37614E-08 | 1.763E-12 | 0 | 2.68655E-06 |
| 160800 | 7.54852E-08 | 1.095E-12 | 0 | 2.12653E-06 |
| 163200 | 6.15011E-08 | 6.34E-13 | 0 | 1.62165E-06 |
| 165600 | 6.15011E-08 | 6.19E-13 | 0 | 1.60322E-06 |
| 168000 | 9.27511E-08 | 1.455E-12 | 0 | 2.4567E-06 |
| 170400 | 8.59018E-08 | 1.175E-12 | 0 | 2.21075E-06 |
| 172800 | 8.39041E-08 | 1.007E-12 | 0 | 2.05098E-06 |
| 175200 | 7.24886E-08 | 5.63E-13 | 0 | 1.5425E-06 |
| 177600 | 7.69121E-08 | 5.3E-13 | 0 | 1.50342E-06 |
| 180000 | 6.97774E-08 | 3.77E-13 | 0 | 1.27355E-06 |
| 182400 | 8.00514E-08 | 4.91E-13 | 0 | 1.45396E-06 |
| 184800 | 8.31906E-08 | 4.38E-13 | 0 | 1.38058E-06 |
| 187200 | 1.24572E-07 | 1.052E-12 | 0 | 2.13456E-06 |
| 189600 | 3.0879E-07 | 1.059E-11 | 0 | 6.68721E-06 |
| 192000 | 6.33276E-07 | 4.3674E-11 | 0 | 1.35862E-05 |
| 194400 | 1.07606E-06 | 1.20119E-10 | 0 | 2.25575E-05 |
| 196800 | 1.44107E-06 | 1.77521E-10 | 0 | 2.75555E-05 |
| 199200 | 2.01356E-06 | 2.69742E-10 | 0 | 3.42042E-05 |
| 201600 | 2.68522E-06 | 3.6458E-10 | 0 | 4.01094E-05 |
| 204000 | 3.60217E-06 | 4.8168E-10 | 0 | 4.66187E-05 |
| 206400 | 4.09047E-06 | 4.71061E-10 | 0 | 4.66302E-05 |
| 208800 | 5.0087E-06 | 5.32967E-10 | 0 | 5.02574E-05 |
| 211200 | 6.02369E-06 | 5.28935E-10 | 0 | 5.11009E-05 |
| 213600 | 7.3847E-06 | 5.79365E-10 | 0 | 5.45619E-05 |
| 216000 | 9.64512E-06 | 7.4054E-10 | 0 | 6.29823E-05 |
| 218400 | 1.23155E-05 | 1.043E-09 | 0 | 7.56147E-05 |
| 220800 | 1.60776E-05 | 1.6408E-09 | 0 | 9.54709E-05 |
| 223200 | 1.96956E-05 | 2.06808E-09 | 0 | 0.000108829 |
| 225600 | 2.28726E-05 | 2.25169E-09 | 0 | 0.000115878 |
| 228000 | 2.65701E-05 | 2.5481E-09 | 0 | 0.000125508 |
| 230400 | 3.04271E-05 | 2.78501E-09 | 0 | 0.000133863 |
| 232800 | 3.48466E-05 | 3.0489E-09 | 0 | 0.000143072 |
| 235200 | 3.86182E-05 | 3.14764E-09 | 0 | 0.000148582 |
| 237600 | 4.26889E-05 | 3.2275E-09 | 0 | 0.000154039 |
| 240000 | 4.67479E-05 | 3.22136E-09 | 0 | 0.000157992 |
| 242400 | 5.08856E-05 | 3.24512E-09 | 0 | 0.000162539 |
| 244800 | 5.46729E-05 | 3.25088E-09 | 0 | 0.000166425 |
| 247200 | 5.86752E-05 | 3.25662E-09 | 0 | 0.000170526 |
| 249600 | 6.20044E-05 | 3.23283E-09 | 0 | 0.000173446 |
| 252000 | 6.54368E-05 | 3.17482E-09 | 0 | 0.000175874 |

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|---|---|---|---|---|
| 254400 | 6.86316E-05 | 3.08175E-09 | 0 | 0.000177438 |
| 256800 | 7.17634E-05 | 3.07181E-09 | 0 | 0.000180394 |
| 259200 | 7.45875E-05 | 2.98334E-09 | 0 | 0.000181643 |
| 261600 | 7.68721E-05 | 2.88966E-09 | 0 | 0.000182233 |
| 264000 | 7.8238E-05 | 2.694E-09 | 0 | 0.000179969 |
| 266400 | 7.89876E-05 | 2.54331E-09 | 0 | 0.000177833 |
| 268800 | 7.91836E-05 | 2.447E-09 | 0 | 0.000176139 |
| 271200 | 7.85888E-05 | 2.26266E-09 | 0 | 0.000171821 |
| 273600 | 7.7974E-05 | 2.11625E-09 | 0 | 0.000168139 |
| 276000 | 7.74519E-05 | 2.03574E-09 | 0 | 0.000165886 |
| 278400 | 7.66557E-05 | 2.04365E-09 | 0 | 0.000165261 |
| 280800 | 7.53191E-05 | 2.02699E-09 | 0 | 0.000163562 |
| 283200 | 7.36497E-05 | 2.01709E-09 | 0 | 0.000161677 |
| 285600 | 7.16862E-05 | 2.01121E-09 | 0 | 0.000159585 |
| 288000 | 6.90539E-05 | 1.92732E-09 | 0 | 0.0001551 |
| 290400 | 6.64289E-05 | 1.78538E-09 | 0 | 0.000149246 |
| 292800 | 6.40605E-05 | 1.70209E-09 | 0 | 0.000144923 |
| 295200 | 6.11945E-05 | 1.65855E-09 | 0 | 0.000141016 |
| 297600 | 5.85779E-05 | 1.61697E-09 | 0 | 0.000137392 |
| 300000 | 5.60395E-05 | 1.53628E-09 | 0 | 0.000132863 |
| 302400 | 5.32964E-05 | 1.46856E-09 | 0 | 0.000128407 |
| 304800 | 5.06026E-05 | 1.39849E-09 | 0 | 0.000123899 |
| 307200 | 4.80959E-05 | 1.36171E-09 | 0 | 0.000120423 |
| 309600 | 4.56799E-05 | 1.30425E-09 | 0 | 0.000116464 |
| 312000 | 4.30126E-05 | 1.21904E-09 | 0 | 0.000111445 |
| 314400 | 4.07527E-05 | 1.17087E-09 | 0 | 0.00010782 |
| 316800 | 3.83736E-05 | 1.12052E-09 | 0 | 0.000103983 |
| 319200 | 3.5992E-05 | 1.0848E-09 | 0 | 0.000100547 |
| 321600 | 3.36407E-05 | 9.95051E-10 | 0 | 9.54678E-05 |
| 324000 | 3.12994E-05 | 8.79426E-10 | 0 | 8.94234E-05 |
| 326400 | 2.913E-05 | 8.04714E-10 | 0 | 8.47303E-05 |
| 328800 | 2.68884E-05 | 7.04151E-10 | 0 | 7.88987E-05 |
| 331200 | 2.49999E-05 | 6.5416E-10 | 0 | 7.51299E-05 |
| 333600 | 2.30778E-05 | 5.80401E-10 | 0 | 7.02971E-05 |
| 336000 | 2.13406E-05 | 5.19916E-10 | 0 | 6.60319E-05 |
| 338400 | 1.95682E-05 | 4.50641E-10 | 0 | 6.11757E-05 |
| 340800 | 1.80801E-05 | 3.99379E-10 | 0 | 5.72496E-05 |
| 343200 | 1.66684E-05 | 3.61175E-10 | 0 | 5.39174E-05 |
| 345600 | 1.54239E-05 | 3.31417E-10 | 0 | 5.11055E-05 |
| 348000 | 1.41327E-05 | 2.91534E-10 | 0 | 4.75985E-05 |
| 350400 | 1.29729E-05 | 2.52583E-10 | 0 | 4.41229E-05 |
| 352800 | 1.19237E-05 | 2.21481E-10 | 0 | 4.10928E-05 |
| 355200 | 1.09172E-05 | 1.97856E-10 | 0 | 3.84869E-05 |
| 357600 | 1.00163E-05 | 1.71887E-10 | 0 | 3.5713E-05 |
| 360000 | 9.2089E-06 | 1.55574E-10 | 0 | 3.36559E-05 |
| 362400 | 8.44806E-06 | 1.39692E-10 | 0 | 3.16136E-05 |
| 364800 | 7.75514E-06 | 1.26811E-10 | 0 | 2.98268E-05 |
| 367200 | 7.12215E-06 | 1.13843E-10 | 0 | 2.80348E-05 |
| 369600 | 6.56749E-06 | 1.07649E-10 | 0 | 2.69033E-05 |
| 372000 | 6.02012E-06 | 9.4505E-11 | 0 | 2.5074E-05 |
| 374400 | 5.49058E-06 | 8.2377E-11 | 0 | 2.32799E-05 |
| 376800 | 5.02754E-06 | 6.8654E-11 | 0 | 2.12676E-05 |
| 379200 | 4.53096E-06 | 5.9036E-11 | 0 | 1.95906E-05 |
| 381600 | 4.19877E-06 | 5.3551E-11 | 0 | 1.85418E-05 |
| 384000 | 3.85374E-06 | 4.7173E-11 | 0 | 1.73155E-05 |
| 386400 | 3.54409E-06 | 4.2572E-11 | 0 | 1.63325E-05 |

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|---|---|---|---|---|
| 388800 | 3.24515E-06 | 3.8737E-11 | 0 | 1.54441E-05 |
| 391200 | 2.998E-06 | 3.4497E-11 | 0 | 1.45099E-05 |
| 393600 | 2.67523E-06 | 2.663E-11 | 0 | 1.27897E-05 |
| 396000 | 2.49486E-06 | 2.4274E-11 | 0 | 1.21516E-05 |
| 398400 | 2.28239E-06 | 2.0719E-11 | 0 | 1.12039E-05 |
| 400800 | 2.09189E-06 | 1.7445E-11 | 0 | 1.02782E-05 |
| 403200 | 1.86601E-06 | 1.3184E-11 | 0 | 8.9827E-06 |
| 405600 | 1.70947E-06 | 1.1545E-11 | 0 | 8.36923E-06 |
| 408000 | 1.57163E-06 | 1.049E-11 | 0 | 7.91968E-06 |
| 410400 | 1.44121E-06 | 9.681E-12 | 0 | 7.53957E-06 |
| 412800 | 1.33176E-06 | 9.085E-12 | 0 | 7.23943E-06 |
| 415200 | 1.21504E-06 | 7.409E-12 | 0 | 6.5499E-06 |
| 417600 | 1.123E-06 | 6.353E-12 | 0 | 6.0632E-06 |
| 420000 | 1.00999E-06 | 5.256E-12 | 0 | 5.50368E-06 |
| 422400 | 9.21946E-07 | 4.679E-12 | 0 | 5.16146E-06 |
| 424800 | 8.57163E-07 | 4.41E-12 | 0 | 4.97305E-06 |
| 427200 | 8.00514E-07 | 4.26E-12 | 0 | 4.84574E-06 |
| 429600 | 7.63271E-07 | 4.22E-12 | 0 | 4.78972E-06 |
| 432000 | 7.47717E-07 | 4.828E-12 | 0 | 5.05448E-06 |
| 434400 | 6.72089E-07 | 4.04E-12 | 0 | 4.61151E-06 |
| 436800 | 6.39412E-07 | 3.562E-12 | 0 | 4.3388E-06 |
| 439200 | 6.02882E-07 | 4.078E-12 | 0 | 4.56082E-06 |
| 441600 | 5.37243E-07 | 3.367E-12 | 0 | 4.13384E-06 |
| 444000 | 5.06279E-07 | 3.176E-12 | 0 | 3.99922E-06 |
| 446400 | 4.73031E-07 | 2.916E-12 | 0 | 3.81998E-06 |
| 448800 | 4.44777E-07 | 3.278E-12 | 0 | 3.99322E-06 |
| 451200 | 4.22374E-07 | 3.977E-12 | 0 | 4.33118E-06 |
| 453600 | 4.1738E-07 | 5.507E-12 | 0 | 5.01682E-06 |
| 456000 | 3.73002E-07 | 3.819E-12 | 0 | 4.20304E-06 |
| 458400 | 3.50742E-07 | 3.581E-12 | 0 | 4.05986E-06 |
| 460800 | 3.33619E-07 | 4.957E-12 | 0 | 4.69763E-06 |
| 463200 | 3.33619E-07 | 4.485E-12 | 0 | 4.48441E-06 |
| 465600 | 3.1464E-07 | 5.564E-12 | 0 | 4.93812E-06 |
| 468000 | 2.86958E-07 | 4.912E-12 | 0 | 4.63097E-06 |
| 470400 | 2.91952E-07 | 5.913E-12 | 0 | 5.05811E-06 |
| 472800 | 2.68693E-07 | 5.252E-12 | 0 | 4.76033E-06 |
| 475200 | 2.52854E-07 | 4.488E-12 | 0 | 4.4051E-06 |
| 477600 | 2.31022E-07 | 3.309E-12 | 0 | 3.79614E-06 |
| 480000 | 2.0234E-07 | 2.496E-12 | 0 | 3.29884E-06 |
| 482400 | 1.93065E-07 | 2.317E-12 | 0 | 3.1763E-06 |
| 484800 | 1.93921E-07 | 2.664E-12 | 0 | 3.39279E-06 |
| 487200 | 1.77797E-07 | 1.941E-12 | 0 | 2.90841E-06 |
| 489600 | 1.74943E-07 | 1.985E-12 | 0 | 2.93618E-06 |
| 492000 | 1.7109E-07 | 1.763E-12 | 0 | 2.77318E-06 |
| 494400 | 1.53967E-07 | 1.268E-12 | 0 | 2.36134E-06 |
| 496800 | 1.38699E-07 | 1.349E-12 | 0 | 2.4149E-06 |
| 499200 | 1.45405E-07 | 1.972E-12 | 0 | 2.89778E-06 |
| 501600 | 1.35274E-07 | 1.195E-12 | 0 | 2.27793E-06 |
| 504000 | 1.15154E-07 | 8.38E-13 | 0 | 1.90939E-06 |
| 506400 | 1.16866E-07 | 9.69E-13 | 0 | 2.04603E-06 |
| 508800 | 1.17437E-07 | 1.101E-12 | 0 | 2.17441E-06 |
| 511200 | 1.09874E-07 | 9.31E-13 | 0 | 2.00106E-06 |
| 513600 | 1.13442E-07 | 1.061E-12 | 0 | 2.13215E-06 |
| 516000 | 1.09018E-07 | 1.08E-12 | 0 | 2.1458E-06 |
| 518400 | 1.01455E-07 | 9.36E-13 | 0 | 1.99795E-06 |
| 520800 | 8.29053E-08 | 4.37E-13 | 0 | 1.3781E-06 |

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|---|---|---|---|---|
| 523200 | 7.59132E-08 | 3.01E-13 | 0 | 1.15099E-06 |
| 525600 | 7.07763E-08 | 2.61E-13 | 0 | 1.07123E-06 |
| 528000 | 7.19178E-08 | 2.15E-13 | 0 | 9.81588E-07 |
| 530400 | 6.15011E-08 | 1.67E-13 | 0 | 8.63054E-07 |
| 532800 | 5.75057E-08 | 1.43E-13 | 0 | 7.98004E-07 |
| 535200 | 5.95034E-08 | 1.55E-13 | 0 | 8.30611E-07 |
| 537600 | 5.29395E-08 | 1.31E-13 | 0 | 7.61026E-07 |
| 540000 | 5.67922E-08 | 1.45E-13 | 0 | 8.02107E-07 |
| 542400 | 5.15126E-08 | 1.67E-13 | 0 | 8.51427E-07 |
| 544800 | 5.15126E-08 | 1.54E-13 | 0 | 8.19549E-07 |
| 547200 | 5.26541E-08 | 1.84E-13 | 0 | 8.92456E-07 |
| 549600 | 5.12272E-08 | 1.61E-13 | 0 | 8.36856E-07 |
| 552000 | 4.55194E-08 | 9.8E-14 | 0 | 6.57933E-07 |
| 554400 | 4.16667E-08 | 7.3E-14 | 0 | 5.71566E-07 |
| 556800 | 4.53767E-08 | 1.24E-13 | 0 | 7.36299E-07 |
| 559200 | 4.39498E-08 | 9E-14 | 0 | 6.33282E-07 |
| 561600 | 3.79566E-08 | 5.8E-14 | 0 | 5.08223E-07 |
| 564000 | 3.75285E-08 | 6.6E-14 | 0 | 5.40046E-07 |
| 566400 | 3.41039E-08 | 5.3E-14 | 0 | 4.84066E-07 |
| 568800 | 3.33904E-08 | 3.6E-14 | 0 | 4.07394E-07 |
| 571200 | 2.92523E-08 | 3.1E-14 | 0 | 3.76493E-07 |
| 573600 | 2.58276E-08 | 2.1E-14 | 0 | 3.10462E-07 |
| 576000 | 2.78253E-08 | 2.3E-14 | 0 | 3.2255E-07 |
| 578400 | 2.49715E-08 | 1.9E-14 | 0 | 2.98126E-07 |
| 580800 | 2.48288E-08 | 1.7E-14 | 0 | 2.80813E-07 |
| 583200 | 2.28311E-08 | 1.6E-14 | 0 | 2.73983E-07 |
| 585600 | 1.65525E-08 | 1E-14 | 0 | 2.14622E-07 |
| 588000 | 2.22603E-08 | 1.8E-14 | 0 | 2.84126E-07 |
| 590400 | 2.18322E-08 | 1.8E-14 | 0 | 2.81813E-07 |
| 592800 | 2.02626E-08 | 1.4E-14 | 0 | 2.55732E-07 |
| 595200 | 2.34018E-08 | 2E-14 | 0 | 2.9887E-07 |
| 597600 | 2.02626E-08 | 1.5E-14 | 0 | 2.61961E-07 |
| 600000 | 1.98345E-08 | 1.6E-14 | 0 | 2.64003E-07 |

**Appendix E. Prediction of mean, variance and upper bound of total solute flux for nonreactive solute with source location at middle layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 |
| 17 | 0 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 | 0 |
| 26 | 0.000535959 | 0.000143339 | 0 | 0.024001893 |
| 27 | 0.00232226 | 0.002691053 | 0 | 0.103997978 |
| 28 | 0.002172603 | 0.002009906 | 0 | 0.090043276 |
| 29 | 0.007168836 | 0.008403206 | 0 | 0.186840086 |
| 30 | 0.010137329 | 0.010320933 | 0 | 0.209257642 |
| 31 | 0.011818151 | 0.009114158 | 0 | 0.198935625 |
| 32 | 0.026031507 | 0.028043405 | 0 | 0.354256351 |
| 33 | 0.054604452 | 0.056083318 | 0 | 0.518770027 |
| 34 | 0.077868493 | 0.091456988 | 0 | 0.670608889 |
| 35 | 0.087767808 | 0.083361833 | 0 | 0.653667825 |
| 36 | 0.107906849 | 0.105726338 | 0 | 0.74521236 |
| 37 | 0.105619521 | 0.083819776 | 0 | 0.673071778 |
| 38 | 0.141227055 | 0.123085011 | 0 | 0.828863149 |
| 39 | 0.166767808 | 0.124908586 | 0 | 0.859479033 |
| 40 | 0.191401027 | 0.153135257 | 0 | 0.958398045 |
| 41 | 0.204386301 | 0.137981958 | 0 | 0.932446401 |
| 42 | 0.233629452 | 0.149935175 | 0 | 0.992570155 |
| 43 | 0.224676027 | 0.131763872 | 0 | 0.936142197 |
| 44 | 0.239779452 | 0.137040208 | 0 | 0.965350733 |
| 45 | 0.228606164 | 0.134813501 | 0 | 0.948258556 |
| 46 | 0.214543493 | 0.12392771 | 0 | 0.904529513 |
| 47 | 0.178189726 | 0.085668301 | 0 | 0.751865032 |
| 48 | 0.160949658 | 0.080012744 | 0 | 0.71536554 |

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|---|---|---|---|---|
| 49 | 0.151796233 | 0.081856635 | 0 | 0.712563974 |
| 50 | 0.134388699 | 0.07061252 | 0 | 0.655219829 |
| 51 | 0.10902774 | 0.039220333 | 0 | 0.497188577 |
| 52 | 0.098821233 | 0.036723505 | 0 | 0.474423446 |
| 53 | 0.083941438 | 0.023993044 | 0 | 0.387539334 |
| 54 | 0.078119863 | 0.023290891 | 0 | 0.377242397 |
| 55 | 0.075439041 | 0.024693559 | 0 | 0.383437063 |
| 56 | 0.06937363 | 0.021233956 | 0 | 0.3549824 |
| 57 | 0.060125342 | 0.017042527 | 0 | 0.315997529 |
| 58 | 0.045892123 | 0.008708626 | 0 | 0.228799367 |
| 59 | 0.039394863 | 0.005423939 | 0 | 0.183743761 |
| 60 | 0.035438699 | 0.004798141 | 0 | 0.171205188 |
| 61 | 0.034561986 | 0.005813395 | 0 | 0.184003413 |
| 62 | 0.034774315 | 0.006326456 | 0 | 0.190670802 |
| 63 | 0.032639384 | 0.005240584 | 0 | 0.174527462 |
| 64 | 0.031403082 | 0.004742508 | 0 | 0.166380195 |
| 65 | 0.029551027 | 0.003600792 | 0 | 0.147163963 |
| 66 | 0.029839726 | 0.004406491 | 0 | 0.159947285 |
| 67 | 0.029921575 | 0.005213079 | 0 | 0.171436822 |
| 68 | 0.026973288 | 0.003542184 | 0 | 0.143625145 |
| 69 | 0.024602397 | 0.003043329 | 0 | 0.132728498 |
| 70 | 0.022737671 | 0.002476483 | 0 | 0.12027566 |
| 71 | 0.023903425 | 0.004106164 | 0 | 0.149498971 |
| 72 | 0.022102397 | 0.00247971 | 0 | 0.119703902 |
| 73 | 0.021175 | 0.002388249 | 0 | 0.116959644 |
| 74 | 0.020422603 | 0.001985599 | 0 | 0.107760325 |
| 75 | 0.01980411 | 0.002078333 | 0 | 0.109158029 |
| 76 | 0.018763699 | 0.001763062 | 0 | 0.101061811 |
| 77 | 0.018094863 | 0.001450292 | 0 | 0.092736956 |
| 78 | 0.017811986 | 0.001478944 | 0 | 0.093187783 |
| 79 | 0.01687911 | 0.001158934 | 0 | 0.08360362 |
| 80 | 0.015842123 | 0.000948211 | 0 | 0.07619647 |
| 81 | 0.015478767 | 0.001086654 | 0 | 0.080089076 |
| 82 | 0.014785274 | 0.000838727 | 0 | 0.071548398 |
| 83 | 0.015222945 | 0.001034679 | 0 | 0.078269136 |
| 84 | 0.015189726 | 0.001168062 | 0 | 0.082176494 |
| 85 | 0.014567808 | 0.000957982 | 0 | 0.075232337 |
| 86 | 0.014342123 | 0.000788546 | 0 | 0.069381014 |
| 87 | 0.014300685 | 0.000837864 | 0 | 0.071034619 |
| 88 | 0.014725342 | 0.001129769 | 0 | 0.080604944 |
| 89 | 0.014393836 | 0.001017975 | 0 | 0.07692906 |
| 90 | 0.014515068 | 0.000895356 | 0 | 0.073163162 |
| 91 | 0.015485616 | 0.001158024 | 0 | 0.08218394 |
| 92 | 0.015468493 | 0.001195138 | 0 | 0.0832272 |
| 93 | 0.015614726 | 0.001262664 | 0 | 0.08526133 |
| 94 | 0.014683219 | 0.000941907 | 0 | 0.074836615 |
| 95 | 0.014429795 | 0.000822857 | 0 | 0.070653334 |
| 96 | 0.014237329 | 0.000752322 | 0 | 0.06799718 |
| 97 | 0.014236301 | 0.000762983 | 0 | 0.068375722 |
| 98 | 0.013946918 | 0.000688377 | 0 | 0.065371335 |
| 99 | 0.013600685 | 0.000651459 | 0 | 0.06362712 |
| 100 | 0.013725342 | 0.000644182 | 0 | 0.063471602 |
| 101 | 0.013575685 | 0.000749113 | 0 | 0.067220744 |
| 102 | 0.013458904 | 0.000741716 | 0 | 0.066838456 |
| 103 | 0.013239726 | 0.000744863 | 0 | 0.066732407 |
| 104 | 0.013296918 | 0.000827394 | 0 | 0.069675257 |

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| 105 | 0.013330479 | 0.000805231 | 0 | 0.068948599 |
| 106 | 0.013228425 | 0.000808869 | 0 | 0.06897204 |
| 107 | 0.013958562 | 0.001022155 | 0 | 0.076622038 |
| 108 | 0.014413699 | 0.001401969 | 0 | 0.087801737 |
| 109 | 0.013340411 | 0.00092655 | 0 | 0.073001423 |
| 110 | 0.013238356 | 0.00081169 | 0 | 0.069079094 |
| 111 | 0.013340068 | 0.000797079 | 0 | 0.068675949 |
| 112 | 0.01332637 | 0.000783194 | 0 | 0.068178169 |
| 113 | 0.01324589 | 0.000725137 | 0 | 0.066025493 |
| 114 | 0.012210274 | 0.000524199 | 0 | 0.057085249 |
| 115 | 0.012112329 | 0.00054958 | 0 | 0.058060853 |
| 116 | 0.012343493 | 0.000686974 | 0 | 0.063715462 |
| 117 | 0.013510274 | 0.001370532 | 0 | 0.08607083 |
| 118 | 0.01212089 | 0.000709403 | 0 | 0.064324762 |
| 119 | 0.011393151 | 0.000593663 | 0 | 0.059148964 |
| 120 | 0.010849658 | 0.000549783 | 0 | 0.056806644 |
| 121 | 0.010510274 | 0.000613118 | 0 | 0.059042259 |
| 122 | 0.010082877 | 0.000494222 | 0 | 0.053655822 |
| 123 | 0.009606507 | 0.000355344 | 0 | 0.046553606 |
| 124 | 0.009459589 | 0.000331688 | 0 | 0.045155721 |
| 125 | 0.009625342 | 0.000369709 | 0 | 0.047311867 |
| 126 | 0.00992226 | 0.000434861 | 0 | 0.050794776 |
| 127 | 0.00957089 | 0.000414519 | 0 | 0.049475958 |
| 128 | 0.00954726 | 0.000434058 | 0 | 0.05038201 |
| 129 | 0.010125342 | 0.000573329 | 0 | 0.057056138 |
| 130 | 0.010280822 | 0.00058399 | 0 | 0.057645954 |
| 131 | 0.009898288 | 0.000471511 | 0 | 0.052458344 |
| 132 | 0.01102363 | 0.001457653 | 0 | 0.08585492 |
| 133 | 0.010412329 | 0.000907434 | 0 | 0.069454677 |
| 134 | 0.010545548 | 0.000817128 | 0 | 0.066573035 |
| 135 | 0.010021233 | 0.000557235 | 0 | 0.056288641 |
| 136 | 0.009530479 | 0.000418357 | 0 | 0.04961989 |
| 137 | 0.009823973 | 0.000572258 | 0 | 0.056710944 |
| 138 | 0.009614384 | 0.000558199 | 0 | 0.055921789 |
| 139 | 0.009436986 | 0.000459508 | 0 | 0.051451795 |
| 140 | 0.009274658 | 0.000431893 | 0 | 0.050007458 |
| 141 | 0.008750342 | 0.000292653 | 0 | 0.042280242 |
| 142 | 0.008719178 | 0.000286088 | 0 | 0.04187089 |
| 143 | 0.008910274 | 0.000315609 | 0 | 0.043730409 |
| 144 | 0.00894863 | 0.000354156 | 0 | 0.045833956 |
| 145 | 0.008621918 | 0.000305934 | 0 | 0.04290424 |
| 146 | 0.008116438 | 0.000240649 | 0 | 0.038521673 |
| 147 | 0.007968836 | 0.000221262 | 0 | 0.037123581 |
| 148 | 0.007894863 | 0.000220681 | 0 | 0.037011323 |
| 149 | 0.008126712 | 0.000256456 | 0 | 0.039514621 |
| 150 | 0.008344178 | 0.000283868 | 0 | 0.041367003 |
| 151 | 0.008176027 | 0.000251147 | 0 | 0.039237384 |
| 152 | 0.008511986 | 0.000438639 | 0 | 0.04956167 |
| 153 | 0.008224658 | 0.000323636 | 0 | 0.043484814 |
| 154 | 0.008401027 | 0.000392514 | 0 | 0.047232465 |
| 155 | 0.008336644 | 0.000376307 | 0 | 0.046357972 |
| 156 | 0.008375342 | 0.000409247 | 0 | 0.048025871 |
| 157 | 0.00785274 | 0.000325401 | 0 | 0.043208954 |
| 158 | 0.00767363 | 0.000338469 | 0 | 0.043732776 |
| 159 | 0.007235959 | 0.000222966 | 0 | 0.036502782 |
| 160 | 0.00739589 | 0.000256565 | 0 | 0.038790471 |

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|---|---|---|---|---|
| 161 | 0.007318493 | 0.000235901 | 0 | 0.037422253 |
| 162 | 0.007057534 | 0.00020377 | 0 | 0.035036115 |
| 163 | 0.007075342 | 0.000214785 | 0 | 0.035800216 |
| 164 | 0.007033904 | 0.000226231 | 0 | 0.036514213 |
| 165 | 0.007038014 | 0.000210471 | 0 | 0.03547297 |
| 166 | 0.007710959 | 0.000327616 | 0 | 0.043187308 |
| 167 | 0.007616781 | 0.000328782 | 0 | 0.043156172 |
| 168 | 0.007627397 | 0.000313467 | 0 | 0.042329196 |
| 169 | 0.007228767 | 0.000285415 | 0 | 0.040341437 |
| 170 | 0.006925342 | 0.000254159 | 0 | 0.03817236 |
| 171 | 0.006842123 | 0.000246912 | 0 | 0.037640458 |
| 172 | 0.006651027 | 0.000225827 | 0 | 0.036104993 |
| 173 | 0.006384932 | 0.000179472 | 0 | 0.032642489 |
| 174 | 0.006406507 | 0.000201553 | 0 | 0.03423252 |
| 175 | 0.006719863 | 0.000289326 | 0 | 0.040058671 |
| 176 | 0.006357534 | 0.000237037 | 0 | 0.036533696 |
| 177 | 0.006511644 | 0.000226604 | 0 | 0.036016256 |
| 178 | 0.006354795 | 0.000211025 | 0 | 0.034827137 |
| 179 | 0.006392808 | 0.000209959 | 0 | 0.034793144 |
| 180 | 0.006390411 | 0.000198393 | 0 | 0.033997408 |
| 181 | 0.006450342 | 0.000216498 | 0 | 0.035289536 |
| 182 | 0.006577397 | 0.000241771 | 0 | 0.037053393 |
| 183 | 0.006511301 | 0.000224352 | 0 | 0.035868946 |
| 184 | 0.006737671 | 0.000301888 | 0 | 0.040792536 |
| 185 | 0.006925 | 0.000377865 | 0 | 0.04502496 |
| 186 | 0.006762671 | 0.000289152 | 0 | 0.040091412 |
| 187 | 0.006560616 | 0.000224479 | 0 | 0.035926559 |
| 188 | 0.006405822 | 0.000213748 | 0 | 0.035061276 |
| 189 | 0.006656849 | 0.00029817 | 0 | 0.040501369 |
| 190 | 0.006974658 | 0.000423537 | 0 | 0.04731151 |
| 191 | 0.006766781 | 0.000349392 | 0 | 0.043403152 |
| 192 | 0.006395548 | 0.000238198 | 0 | 0.036645557 |
| 193 | 0.006396575 | 0.00022557 | 0 | 0.035833771 |
| 194 | 0.006330822 | 0.000241812 | 0 | 0.036809406 |
| 195 | 0.005934932 | 0.000196444 | 0 | 0.033406019 |
| 196 | 0.005841096 | 0.000181166 | 0 | 0.032222272 |
| 197 | 0.005796233 | 0.000165395 | 0 | 0.031003006 |
| 198 | 0.005987329 | 0.000180261 | 0 | 0.032302511 |
| 199 | 0.006217808 | 0.000240507 | 0 | 0.036614059 |
| 200 | 0.006203767 | 0.000257949 | 0 | 0.037682924 |
| 201 | 0.006193493 | 0.000245663 | 0 | 0.036913831 |
| 202 | 0.006027397 | 0.000236106 | 0 | 0.036144249 |
| 203 | 0.006217123 | 0.000292343 | 0 | 0.039729277 |
| 204 | 0.00597911 | 0.000244126 | 0 | 0.036603207 |
| 205 | 0.005907192 | 0.000217552 | 0 | 0.034816503 |
| 206 | 0.005738014 | 0.000219471 | 0 | 0.034774516 |
| 207 | 0.00547089 | 0.000164638 | 0 | 0.030619926 |
| 208 | 0.005509932 | 0.000173608 | 0 | 0.031334945 |
| 209 | 0.005392466 | 0.000171746 | 0 | 0.031078659 |
| 210 | 0.005469178 | 0.0001814 | 0 | 0.031867378 |
| 211 | 0.005353767 | 0.000173672 | 0 | 0.031183562 |
| 212 | 0.005448288 | 0.00019228 | 0 | 0.032626674 |
| 213 | 0.005607534 | 0.000231112 | 0 | 0.035404175 |
| 214 | 0.005514041 | 0.000208309 | 0 | 0.033802572 |
| 215 | 0.005496233 | 0.000213122 | 0 | 0.03410968 |
| 216 | 0.005730822 | 0.000261761 | 0 | 0.037441744 |

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|---|---|---|---|---|
| 217 | 0.005623973 | 0.000242436 | 0 | 0.036141862 |
| 218 | 0.005539384 | 0.000200207 | 0 | 0.033272294 |
| 219 | 0.00537637 | 0.000160041 | 0 | 0.030171788 |
| 220 | 0.005272603 | 0.000151093 | 0 | 0.029364919 |
| 221 | 0.005198973 | 0.000152215 | 0 | 0.029380558 |
| 222 | 0.005365753 | 0.000162878 | 0 | 0.030380009 |
| 223 | 0.005424658 | 0.000164355 | 0 | 0.030552056 |
| 224 | 0.005406164 | 0.000157276 | 0 | 0.029986509 |
| 225 | 0.005507877 | 0.000163429 | 0 | 0.030564405 |
| 226 | 0.005484589 | 0.000159683 | 0 | 0.030252285 |
| 227 | 0.005481849 | 0.000164467 | 0 | 0.030617818 |
| 228 | 0.005354795 | 0.000153436 | 0 | 0.029633201 |
| 229 | 0.005268836 | 0.000150194 | 0 | 0.029289318 |
| 230 | 0.005143151 | 0.000135799 | 0 | 0.027983557 |
| 231 | 0.004841438 | 0.000107304 | 0 | 0.025144594 |
| 232 | 0.004699658 | 0.000102687 | 0 | 0.024561208 |
| 233 | 0.004526027 | 9.36163E-05 | 0 | 0.023490113 |
| 234 | 0.00454726 | 9.8073E-05 | 0 | 0.023957497 |
| 235 | 0.004499658 | 0.000105811 | 0 | 0.024661087 |
| 236 | 0.004547945 | 0.000120272 | 0 | 0.026043004 |
| 237 | 0.004589041 | 0.000153501 | 0 | 0.028872601 |
| 238 | 0.004618151 | 0.000169757 | 0 | 0.030155146 |
| 239 | 0.004517466 | 0.000164641 | 0 | 0.029666718 |
| 240 | 0.004517123 | 0.000169741 | 0 | 0.030052898 |
| 241 | 0.004351712 | 0.000152114 | 0 | 0.028525302 |
| 242 | 0.004178082 | 0.000109694 | 0 | 0.024706103 |
| 243 | 0.004103425 | 9.02913E-05 | 0 | 0.022727684 |
| 244 | 0.004090753 | 9.70701E-05 | 0 | 0.023401489 |
| 245 | 0.004230822 | 0.000133552 | 0 | 0.026881523 |
| 246 | 0.00409726 | 9.71474E-05 | 0 | 0.023415685 |
| 247 | 0.003955137 | 8.66212E-05 | 0 | 0.022196959 |
| 248 | 0.003906164 | 9.44901E-05 | 0 | 0.022958542 |
| 249 | 0.004013014 | 0.000113779 | 0 | 0.024919806 |
| 250 | 0.00377774 | 8.47541E-05 | 0 | 0.021821892 |

**Appendix F. Prediction of mean, variance and upper bound of total solute flux for weak-sorption solute with source location at middle layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 20 | 0 | 0 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 |
| 60 | 0 | 0 | 0 | 0 |
| 80 | 0 | 0 | 0 | 0 |
| 100 | 0 | 0 | 0 | 0 |
| 120 | 0 | 0 | 0 | 0 |
| 140 | 2.08048E-05 | 2.15987E-07 | 0 | 0.000931703 |
| 160 | 0.000714572 | 6.23527E-05 | 0 | 0.016191465 |
| 180 | 0.004411558 | 0.000316839 | 0 | 0.039299497 |
| 200 | 0.014431592 | 0.001041564 | 0 | 0.077687205 |
| 220 | 0.026094521 | 0.00147751 | 0 | 0.101433768 |
| 240 | 0.034295959 | 0.001468843 | 0 | 0.109413919 |
| 260 | 0.029731952 | 0.001100565 | 0 | 0.094754501 |
| 280 | 0.020380599 | 0.000721215 | 0 | 0.073017258 |
| 300 | 0.012865582 | 0.000319984 | 0 | 0.04792623 |
| 320 | 0.009005788 | 0.000168341 | 0 | 0.034436025 |
| 340 | 0.006342106 | 8.92339E-05 | 0 | 0.024856996 |
| 360 | 0.005001815 | 6.97311E-05 | 0 | 0.021368828 |
| 380 | 0.004221781 | 4.29506E-05 | 0 | 0.017066978 |
| 400 | 0.003718459 | 4.04739E-05 | 0 | 0.016187797 |
| 420 | 0.003171627 | 2.89741E-05 | 0 | 0.013721832 |
| 440 | 0.00304464 | 3.38756E-05 | 0 | 0.014452377 |
| 460 | 0.002865137 | 3.52722E-05 | 0 | 0.014505657 |
| 480 | 0.002546233 | 2.16251E-05 | 0 | 0.011660791 |
| 500 | 0.002357295 | 1.83916E-05 | 0 | 0.01076283 |
| 520 | 0.00225363 | 1.87758E-05 | 0 | 0.01074651 |
| 540 | 0.002232654 | 2.04016E-05 | 0 | 0.011085614 |
| 560 | 0.00242488 | 3.16608E-05 | 0 | 0.013453399 |
| 580 | 0.002020308 | 1.61168E-05 | 0 | 0.009888873 |
| 600 | 0.001819726 | 1.33381E-05 | 0 | 0.008977906 |
| 620 | 0.001628168 | 1.00041E-05 | 0 | 0.007827497 |
| 640 | 0.001565497 | 1.02607E-05 | 0 | 0.007843833 |
| 660 | 0.00156714 | 1.40818E-05 | 0 | 0.008922176 |
| 680 | 0.001390565 | 9.89812E-06 | 0 | 0.007556975 |
| 700 | 0.001175565 | 5.20188E-06 | 0 | 0.005645862 |
| 720 | 0.001225908 | 6.49902E-06 | 0 | 0.006222571 |
| 740 | 0.001181541 | 4.99995E-06 | 0 | 0.005564212 |
| 760 | 0.001121045 | 4.81636E-06 | 0 | 0.005422503 |
| 780 | 0.001118579 | 5.68477E-06 | 0 | 0.005791759 |
| 800 | 0.001090634 | 5.02031E-06 | 0 | 0.005482218 |
| 820 | 0.001044486 | 4.70335E-06 | 0 | 0.005295178 |
| 840 | 0.001062277 | 5.2865E-06 | 0 | 0.005568784 |
| 860 | 0.001019452 | 4.08776E-06 | 0 | 0.004982222 |
| 880 | 0.000968767 | 3.53842E-06 | 0 | 0.004655661 |
| 900 | 0.000963527 | 3.74594E-06 | 0 | 0.004756998 |
| 920 | 0.000954932 | 3.88546E-06 | 0 | 0.004818397 |
| 940 | 0.000956404 | 3.86247E-06 | 0 | 0.004808426 |
| 960 | 0.000968545 | 4.52875E-06 | 0 | 0.005139594 |
| 980 | 0.001056575 | 5.76591E-06 | 0 | 0.005762986 |

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| 1000 | 0.001059247 | 4.55429E-06 | 0 | 0.005242041 |
| 1020 | 0.00102899 | 4.16727E-06 | 0 | 0.005030112 |
| 1040 | 0.001028545 | 4.22737E-06 | 0 | 0.005058416 |
| 1060 | 0.000967021 | 3.21076E-06 | 0 | 0.004479064 |
| 1080 | 0.00093911 | 2.93956E-06 | 0 | 0.004299558 |
| 1100 | 0.00096512 | 3.75947E-06 | 0 | 0.004765435 |
| 1120 | 0.000979315 | 4.79267E-06 | 0 | 0.005270182 |
| 1140 | 0.000997654 | 4.38302E-06 | 0 | 0.005101046 |
| 1160 | 0.00101887 | 5.34861E-06 | 0 | 0.005551774 |
| 1180 | 0.001017089 | 5.88879E-06 | 0 | 0.005773386 |
| 1200 | 0.000912021 | 4.26968E-06 | 0 | 0.004962007 |
| 1220 | 0.00088851 | 3.64581E-06 | 0 | 0.004630936 |
| 1240 | 0.000937158 | 5.09762E-06 | 0 | 0.005362429 |
| 1260 | 0.00088113 | 3.11504E-06 | 0 | 0.004340429 |
| 1280 | 0.00090214 | 3.81507E-06 | 0 | 0.004730454 |
| 1300 | 0.000904007 | 3.85282E-06 | 0 | 0.004751211 |
| 1320 | 0.000850942 | 2.99187E-06 | 0 | 0.004241157 |
| 1340 | 0.000779178 | 2.17549E-06 | 0 | 0.003670089 |
| 1360 | 0.000778767 | 3.3069E-06 | 0 | 0.004343005 |
| 1380 | 0.000755068 | 2.41131E-06 | 0 | 0.003798633 |
| 1400 | 0.000715377 | 1.92525E-06 | 0 | 0.00343494 |
| 1420 | 0.000690342 | 1.77849E-06 | 0 | 0.003304201 |
| 1440 | 0.000688527 | 2.29628E-06 | 0 | 0.003658612 |
| 1460 | 0.000647158 | 1.66301E-06 | 0 | 0.003174727 |
| 1480 | 0.000696524 | 2.67061E-06 | 0 | 0.003899557 |
| 1500 | 0.000669966 | 2.18468E-06 | 0 | 0.003566977 |
| 1520 | 0.000685479 | 2.59397E-06 | 0 | 0.003842216 |
| 1540 | 0.000693904 | 2.28791E-06 | 0 | 0.003658567 |
| 1560 | 0.000716575 | 2.56919E-06 | 0 | 0.003858201 |
| 1580 | 0.000785514 | 5.61565E-06 | 0 | 0.005430199 |
| 1600 | 0.00075036 | 5.08848E-06 | 0 | 0.005171663 |
| 1620 | 0.000719075 | 3.57736E-06 | 0 | 0.0044262 |
| 1640 | 0.00064786 | 2.3957E-06 | 0 | 0.00368156 |
| 1660 | 0.000613373 | 1.54662E-06 | 0 | 0.00305089 |
| 1680 | 0.000570497 | 1.16012E-06 | 0 | 0.002681587 |
| 1700 | 0.00057488 | 1.18354E-06 | 0 | 0.00270718 |
| 1720 | 0.000590582 | 1.2941E-06 | 0 | 0.00282025 |
| 1740 | 0.000627192 | 1.67247E-06 | 0 | 0.003161941 |
| 1760 | 0.000637945 | 1.86125E-06 | 0 | 0.003311924 |
| 1780 | 0.000611661 | 1.85733E-06 | 0 | 0.003282826 |
| 1800 | 0.000564863 | 1.28633E-06 | 0 | 0.00278783 |
| 1820 | 0.000562192 | 1.31528E-06 | 0 | 0.002810027 |
| 1840 | 0.000563562 | 1.34978E-06 | 0 | 0.002840692 |
| 1860 | 0.000564932 | 1.4735E-06 | 0 | 0.002944132 |
| 1880 | 0.000551387 | 1.52542E-06 | 0 | 0.002972143 |
| 1900 | 0.000533236 | 1.50973E-06 | 0 | 0.002941508 |
| 1920 | 0.000515753 | 1.567E-06 | 0 | 0.002969277 |
| 1940 | 0.000486216 | 1.00988E-06 | 0 | 0.002455879 |
| 1960 | 0.000494349 | 1.05564E-06 | 0 | 0.002508136 |
| 1980 | 0.000493596 | 1.05598E-06 | 0 | 0.002507707 |
| 2000 | 0.000515856 | 1.41073E-06 | 0 | 0.002843827 |
| 2020 | 0.000517209 | 1.44391E-06 | 0 | 0.002872401 |
| 2040 | 0.000504247 | 1.25948E-06 | 0 | 0.002703888 |
| 2060 | 0.000499486 | 1.30645E-06 | 0 | 0.002739771 |
| 2080 | 0.000485086 | 1.25822E-06 | 0 | 0.002683627 |
| 2100 | 0.000443682 | 1.07208E-06 | 0 | 0.002473091 |

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|---|---|---|---|---|
| 2120 | 0.000435959 | 9.22701E-07 | 0 | 0.002318682 |
| 2140 | 0.000444366 | 1.08395E-06 | 0 | 0.002484975 |
| 2160 | 0.000450497 | 1.13386E-06 | 0 | 0.002537558 |
| 2180 | 0.000466644 | 1.20944E-06 | 0 | 0.002622143 |
| 2200 | 0.000463442 | 1.0543E-06 | 0 | 0.002475954 |
| 2220 | 0.000475342 | 1.23291E-06 | 0 | 0.002651655 |
| 2240 | 0.000452825 | 1.05085E-06 | 0 | 0.002462045 |
| 2260 | 0.00045863 | 1.11553E-06 | 0 | 0.002528756 |
| 2280 | 0.000482774 | 1.50701E-06 | 0 | 0.002888874 |
| 2300 | 0.000466832 | 1.464E-06 | 0 | 0.002838351 |
| 2320 | 0.000465651 | 1.22457E-06 | 0 | 0.002634592 |
| 2340 | 0.000475908 | 1.38127E-06 | 0 | 0.002779445 |
| 2360 | 0.000511438 | 2.09357E-06 | 0 | 0.003347398 |
| 2380 | 0.000484675 | 1.63601E-06 | 0 | 0.002991642 |
| 2400 | 0.000444486 | 1.09657E-06 | 0 | 0.002496947 |
| 2420 | 0.000460993 | 1.35471E-06 | 0 | 0.002742278 |
| 2440 | 0.00043476 | 1.01105E-06 | 0 | 0.002405558 |
| 2460 | 0.000412175 | 8.394E-07 | 0 | 0.002207903 |
| 2480 | 0.000422894 | 1.25893E-06 | 0 | 0.002622057 |
| 2500 | 0.000425599 | 1.2517E-06 | 0 | 0.00261844 |
| 2520 | 0.000422517 | 1.11466E-06 | 0 | 0.002491831 |
| 2540 | 0.000427003 | 1.25243E-06 | 0 | 0.00262048 |
| 2560 | 0.000404503 | 1.04206E-06 | 0 | 0.002405299 |
| 2580 | 0.000393767 | 9.79264E-07 | 0 | 0.00233334 |
| 2600 | 0.000397774 | 9.30817E-07 | 0 | 0.00228876 |
| 2620 | 0.000403699 | 9.79785E-07 | 0 | 0.002343787 |
| 2640 | 0.000411558 | 1.16427E-06 | 0 | 0.002526422 |
| 2660 | 0.000419623 | 1.20664E-06 | 0 | 0.002572626 |
| 2680 | 0.00043774 | 1.49041E-06 | 0 | 0.00283055 |
| 2700 | 0.000435582 | 1.25368E-06 | 0 | 0.002630152 |
| 2720 | 0.00040238 | 9.41423E-07 | 0 | 0.002304108 |
| 2740 | 0.000381986 | 8.07992E-07 | 0 | 0.002143798 |
| 2760 | 0.000389538 | 9.36903E-07 | 0 | 0.002286695 |
| 2780 | 0.00036637 | 7.73993E-07 | 0 | 0.002090717 |
| 2800 | 0.000375616 | 7.99912E-07 | 0 | 0.002128597 |
| 2820 | 0.000373219 | 7.69839E-07 | 0 | 0.002092933 |
| 2840 | 0.00037726 | 7.82329E-07 | 0 | 0.002110868 |
| 2860 | 0.000368853 | 7.50588E-07 | 0 | 0.002066928 |
| 2880 | 0.000348236 | 6.34927E-07 | 0 | 0.00191001 |
| 2900 | 0.000333647 | 5.80259E-07 | 0 | 0.001826672 |
| 2920 | 0.000311678 | 4.71718E-07 | 0 | 0.00165784 |
| 2940 | 0.000302705 | 4.36754E-07 | 0 | 0.001598018 |
| 2960 | 0.000309315 | 4.96681E-07 | 0 | 0.001690636 |
| 2980 | 0.000316541 | 5.82267E-07 | 0 | 0.001812147 |
| 3000 | 0.000316798 | 6.12897E-07 | 0 | 0.001851237 |
| 3020 | 0.000296301 | 4.51399E-07 | 0 | 0.001613151 |
| 3040 | 0.000295171 | 4.28074E-07 | 0 | 0.001577548 |
| 3060 | 0.000294315 | 4.57191E-07 | 0 | 0.001619587 |
| 3080 | 0.000300497 | 5.49995E-07 | 0 | 0.001754065 |
| 3100 | 0.00030238 | 6.8157E-07 | 0 | 0.001920502 |
| 3120 | 0.000314469 | 8.82986E-07 | 0 | 0.002156229 |
| 3140 | 0.00029262 | 5.14232E-07 | 0 | 0.001698136 |
| 3160 | 0.000282312 | 4.43906E-07 | 0 | 0.001588186 |
| 3180 | 0.000275257 | 4.05571E-07 | 0 | 0.001523473 |
| 3200 | 0.000277072 | 4.88534E-07 | 0 | 0.001647019 |
| 3220 | 0.00026911 | 4.19464E-07 | 0 | 0.001538524 |

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| 3240 | 0.000260805 | 3.31086E-07 | 0 | 0.001388591 |
| 3260 | 0.000267089 | 3.39451E-07 | 0 | 0.001409033 |
| 3280 | 0.000267192 | 3.51943E-07 | 0 | 0.001429958 |
| 3300 | 0.000263921 | 3.33457E-07 | 0 | 0.001395738 |
| 3320 | 0.000261695 | 3.48397E-07 | 0 | 0.001418589 |
| 3340 | 0.000267723 | 3.71519E-07 | 0 | 0.001462389 |
| 3360 | 0.000272723 | 3.86532E-07 | 0 | 0.001491289 |
| 3380 | 0.000270771 | 3.60023E-07 | 0 | 0.001446809 |
| 3400 | 0.000269264 | 3.58405E-07 | 0 | 0.001442655 |
| 3420 | 0.000268853 | 3.70862E-07 | 0 | 0.001462462 |
| 3440 | 0.000268476 | 3.64602E-07 | 0 | 0.001451969 |
| 3460 | 0.00027262 | 4.02114E-07 | 0 | 0.001515504 |
| 3480 | 0.000259486 | 3.50589E-07 | 0 | 0.001420013 |
| 3500 | 0.000264435 | 3.81428E-07 | 0 | 0.001474929 |
| 3520 | 0.000257637 | 3.67262E-07 | 0 | 0.001445439 |
| 3540 | 0.000258682 | 3.82882E-07 | 0 | 0.00147148 |
| 3560 | 0.000266695 | 4.18616E-07 | 0 | 0.001534826 |
| 3580 | 0.000260514 | 3.96775E-07 | 0 | 0.00149512 |
| 3600 | 0.000256524 | 3.72831E-07 | 0 | 0.001453298 |
| 3620 | 0.000265137 | 4.19897E-07 | 0 | 0.001535207 |
| 3640 | 0.000275753 | 4.94373E-07 | 0 | 0.001653863 |
| 3660 | 0.000265377 | 4.33492E-07 | 0 | 0.001555842 |
| 3680 | 0.000265445 | 5.16843E-07 | 0 | 0.001674525 |
| 3700 | 0.000256336 | 3.78374E-07 | 0 | 0.001461973 |
| 3720 | 0.00023976 | 3.00856E-07 | 0 | 0.001314827 |
| 3740 | 0.00023851 | 3.13187E-07 | 0 | 0.001335386 |
| 3760 | 0.000239401 | 3.14665E-07 | 0 | 0.001338864 |
| 3780 | 0.000243818 | 3.78716E-07 | 0 | 0.00145 |
| 3800 | 0.000241507 | 3.42877E-07 | 0 | 0.001389199 |
| 3820 | 0.000237277 | 3.43973E-07 | 0 | 0.001386802 |
| 3840 | 0.000235788 | 3.29628E-07 | 0 | 0.001361087 |
| 3860 | 0.000238596 | 3.42344E-07 | 0 | 0.001385395 |
| 3880 | 0.000246712 | 4.18499E-07 | 0 | 0.001514665 |
| 3900 | 0.000252123 | 4.59505E-07 | 0 | 0.001580745 |
| 3920 | 0.000254623 | 4.82637E-07 | 0 | 0.001616276 |
| 3940 | 0.000243219 | 4.08699E-07 | 0 | 0.001496239 |
| 3960 | 0.000228664 | 3.49043E-07 | 0 | 0.001386629 |
| 3980 | 0.00022601 | 3.17458E-07 | 0 | 0.001330342 |
| 4000 | 0.000226935 | 3.16581E-07 | 0 | 0.001329739 |
| 4020 | 0.000227723 | 3.11033E-07 | 0 | 0.00132082 |
| 4040 | 0.000237637 | 3.28946E-07 | 0 | 0.001361771 |
| 4060 | 0.000237723 | 3.55579E-07 | 0 | 0.00140648 |
| 4080 | 0.000235548 | 3.45302E-07 | 0 | 0.001387291 |
| 4100 | 0.000243853 | 4.15184E-07 | 0 | 0.001506774 |
| 4120 | 0.000240377 | 4.75254E-07 | 0 | 0.001591575 |
| 4140 | 0.000230634 | 3.63351E-07 | 0 | 0.001412094 |
| 4160 | 0.00022411 | 3.24078E-07 | 0 | 0.001339895 |
| 4180 | 0.00022476 | 3.27854E-07 | 0 | 0.001347028 |
| 4200 | 0.000223288 | 3.11316E-07 | 0 | 0.001316884 |
| 4220 | 0.000227945 | 3.3169E-07 | 0 | 0.001356759 |
| 4240 | 0.000221729 | 2.85711E-07 | 0 | 0.001269387 |
| 4260 | 0.000218767 | 2.60724E-07 | 0 | 0.001219565 |
| 4280 | 0.000220291 | 2.75853E-07 | 0 | 0.001249717 |
| 4300 | 0.000227723 | 3.21649E-07 | 0 | 0.00133932 |
| 4320 | 0.000232911 | 3.61689E-07 | 0 | 0.001411666 |
| 4340 | 0.000224298 | 3.22448E-07 | 0 | 0.001337273 |

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|---|---|---|---|---|
| 4360 | 0.000212979 | 2.4959E-07 | 0 | 0.001192176 |
| 4380 | 0.000207774 | 2.41258E-07 | 0 | 0.001170487 |
| 4400 | 0.000213442 | 2.82304E-07 | 0 | 0.001254834 |
| 4420 | 0.000209195 | 2.72935E-07 | 0 | 0.001233161 |
| 4440 | 0.000215634 | 2.79028E-07 | 0 | 0.001250966 |
| 4460 | 0.000214264 | 2.82966E-07 | 0 | 0.001256876 |
| 4480 | 0.000218134 | 3.0301E-07 | 0 | 0.001297043 |
| 4500 | 0.000220137 | 3.07696E-07 | 0 | 0.001307357 |
| 4520 | 0.000218253 | 2.96461E-07 | 0 | 0.001285439 |
| 4540 | 0.000221318 | 2.92096E-07 | 0 | 0.001280619 |
| 4560 | 0.000228836 | 3.25827E-07 | 0 | 0.001347628 |
| 4580 | 0.000224144 | 3.40755E-07 | 0 | 0.001368279 |
| 4600 | 0.000220428 | 3.24977E-07 | 0 | 0.00133776 |
| 4620 | 0.000223887 | 3.46873E-07 | 0 | 0.001378247 |
| 4640 | 0.000222397 | 3.30322E-07 | 0 | 0.00134888 |
| 4660 | 0.000216473 | 3.03842E-07 | 0 | 0.00129686 |
| 4680 | 0.000220051 | 3.14191E-07 | 0 | 0.001318685 |
| 4700 | 0.000218664 | 3.13735E-07 | 0 | 0.0013165 |
| 4720 | 0.000225753 | 3.44986E-07 | 0 | 0.00137697 |
| 4740 | 0.000219846 | 3.09726E-07 | 0 | 0.001310645 |
| 4760 | 0.000227568 | 3.84198E-07 | 0 | 0.001442449 |
| 4780 | 0.000229572 | 3.99668E-07 | 0 | 0.00146867 |
| 4800 | 0.000236935 | 4.08188E-07 | 0 | 0.001489171 |
| 4820 | 0.000249469 | 4.89982E-07 | 0 | 0.001621444 |
| 4840 | 0.000227774 | 3.52781E-07 | 0 | 0.001391924 |
| 4860 | 0.000225805 | 3.28112E-07 | 0 | 0.001348514 |
| 4880 | 0.000219469 | 3.08688E-07 | 0 | 0.001308439 |
| 4900 | 0.000220205 | 3.0762E-07 | 0 | 0.00130729 |
| 4920 | 0.000212842 | 3.13171E-07 | 0 | 0.001309692 |
| 4940 | 0.000203716 | 2.45611E-07 | 0 | 0.001175075 |
| 4960 | 0.000195086 | 2.18811E-07 | 0 | 0.00111192 |
| 4980 | 0.000194144 | 2.31522E-07 | 0 | 0.001137231 |
| 5000 | 0.000203031 | 2.77653E-07 | 0 | 0.00123581 |

**Appendix G. Prediction of mean, variance and upper bound of total solute flux for strong-sorption solute with source location at middle layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 10000 | 0 | 0 | 0 | 0 |
| 20000 | 0 | 0 | 0 | 0 |
| 30000 | 0 | 0 | 0 | 0 |
| 40000 | 0 | 0 | 0 | 0 |
| 50000 | 0 | 0 | 0 | 0 |
| 60000 | 0 | 0 | 0 | 0 |
| 70000 | 0 | 0 | 0 | 0 |
| 80000 | 0 | 0 | 0 | 0 |
| 90000 | 0 | 0 | 0 | 0 |
| 100000 | 3.73767E-07 | 6.9711E-11 | 0 | 1.67384E-05 |
| 110000 | 1.91524E-06 | 3.3883E-10 | 0 | 3.79936E-05 |
| 120000 | 7.72452E-06 | 1.10635E-09 | 0 | 7.29177E-05 |
| 130000 | 2.31225E-05 | 3.66096E-09 | 0 | 0.000141714 |
| 140000 | 3.26203E-05 | 4.17992E-09 | 0 | 0.000159339 |
| 150000 | 5.06654E-05 | 5.97383E-09 | 0 | 0.000202155 |
| 160000 | 5.91345E-05 | 5.54625E-09 | 0 | 0.000205102 |
| 170000 | 5.41612E-05 | 4.98312E-09 | 0 | 0.00019252 |
| 180000 | 3.99474E-05 | 3.42685E-09 | 0 | 0.000154684 |
| 190000 | 2.75626E-05 | 1.87973E-09 | 0 | 0.00011254 |
| 200000 | 1.90146E-05 | 1.12404E-09 | 0 | 8.47269E-05 |
| 210000 | 1.4301E-05 | 7.13416E-10 | 0 | 6.66523E-05 |
| 220000 | 1.00752E-05 | 3.09549E-10 | 0 | 4.45595E-05 |
| 230000 | 8.33182E-06 | 2.93378E-10 | 0 | 4.19032E-05 |
| 240000 | 7.11822E-06 | 1.99695E-10 | 0 | 3.48157E-05 |
| 250000 | 6.68188E-06 | 1.79443E-10 | 0 | 3.29373E-05 |
| 260000 | 5.96014E-06 | 1.40956E-10 | 0 | 2.92302E-05 |
| 270000 | 5.15976E-06 | 1.02511E-10 | 0 | 2.50043E-05 |
| 280000 | 4.85353E-06 | 9.3832E-11 | 0 | 2.38394E-05 |
| 290000 | 4.93791E-06 | 1.15801E-10 | 0 | 2.60296E-05 |
| 300000 | 4.79757E-06 | 1.14001E-10 | 0 | 2.57247E-05 |
| 310000 | 4.18685E-06 | 8.7896E-11 | 0 | 2.25624E-05 |
| 320000 | 3.49774E-06 | 4.1945E-11 | 0 | 1.61916E-05 |
| 330000 | 3.62685E-06 | 6.5422E-11 | 0 | 1.94801E-05 |
| 340000 | 3.47719E-06 | 7.3267E-11 | 0 | 2.0254E-05 |
| 350000 | 3.0163E-06 | 4.3382E-11 | 0 | 1.59258E-05 |
| 360000 | 2.79682E-06 | 3.2719E-11 | 0 | 1.40082E-05 |
| 370000 | 2.86568E-06 | 4.1822E-11 | 0 | 1.55409E-05 |
| 380000 | 2.67524E-06 | 3.5569E-11 | 0 | 1.43647E-05 |
| 390000 | 2.38147E-06 | 2.1478E-11 | 0 | 1.1465E-05 |
| 400000 | 2.31017E-06 | 2.146E-11 | 0 | 1.13899E-05 |
| 410000 | 2.25507E-06 | 2.2376E-11 | 0 | 1.15265E-05 |
| 420000 | 2.25757E-06 | 2.1954E-11 | 0 | 1.14411E-05 |
| 430000 | 2.31805E-06 | 2.5006E-11 | 0 | 1.21193E-05 |
| 440000 | 2.22236E-06 | 1.9884E-11 | 0 | 1.09623E-05 |
| 450000 | 0.000002215 | 2.3209E-11 | 0 | 1.16575E-05 |
| 460000 | 2.08976E-06 | 1.8487E-11 | 0 | 1.0517E-05 |
| 470000 | 2.33562E-06 | 2.6583E-11 | 0 | 1.24411E-05 |
| 480000 | 2.44051E-06 | 3.0027E-11 | 0 | 1.31807E-05 |
| 490000 | 2.3463E-06 | 2.2371E-11 | 0 | 1.16168E-05 |

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|---|---|---|---|---|
| 500000 | 2.4088E-06 | 2.4453E-11 | 0 | 1.2101E-05 |
| 510000 | 2.19877E-06 | 1.7105E-11 | 0 | 1.03049E-05 |
| 520000 | 2.15894E-06 | 1.663E-11 | 0 | 1.01519E-05 |
| 530000 | 2.09616E-06 | 1.8384E-11 | 0 | 1.05E-05 |
| 540000 | 2.17462E-06 | 2.2239E-11 | 0 | 1.14177E-05 |
| 550000 | 2.35247E-06 | 2.8628E-11 | 0 | 1.28394E-05 |
| 560000 | 2.22562E-06 | 2.8494E-11 | 0 | 1.26881E-05 |
| 570000 | 2.13432E-06 | 2.447E-11 | 0 | 1.18299E-05 |
| 580000 | 2.09346E-06 | 2.0396E-11 | 0 | 1.09452E-05 |
| 590000 | 1.96914E-06 | 1.57E-11 | 0 | 9.73522E-06 |
| 600000 | 1.95805E-06 | 1.4374E-11 | 0 | 9.38912E-06 |
| 610000 | 2.17832E-06 | 2.4537E-11 | 0 | 1.18871E-05 |
| 620000 | 2.04034E-06 | 2.1035E-11 | 0 | 1.10296E-05 |
| 630000 | 1.85582E-06 | 1.5861E-11 | 0 | 9.66173E-06 |
| 640000 | 1.8139E-06 | 1.4537E-11 | 0 | 9.28693E-06 |
| 650000 | 1.74846E-06 | 1.6734E-11 | 0 | 9.76618E-06 |
| 660000 | 1.52312E-06 | 8.362E-12 | 0 | 7.19101E-06 |
| 670000 | 1.50414E-06 | 9.15E-12 | 0 | 7.43284E-06 |
| 680000 | 1.54921E-06 | 1.1437E-11 | 0 | 8.17759E-06 |
| 690000 | 1.47548E-06 | 9.655E-12 | 0 | 7.56576E-06 |
| 700000 | 1.55164E-06 | 1.2208E-11 | 0 | 8.39981E-06 |
| 710000 | 1.4887E-06 | 1.1223E-11 | 0 | 8.05475E-06 |
| 720000 | 1.5263E-06 | 1.2211E-11 | 0 | 8.37549E-06 |
| 730000 | 1.65846E-06 | 1.441E-11 | 0 | 9.09882E-06 |
| 740000 | 1.75233E-06 | 3.2483E-11 | 0 | 1.29232E-05 |
| 750000 | 1.60514E-06 | 1.9722E-11 | 0 | 1.03093E-05 |
| 760000 | 1.59836E-06 | 1.8225E-11 | 0 | 9.96568E-06 |
| 770000 | 1.45158E-06 | 1.197E-11 | 0 | 8.23261E-06 |
| 780000 | 1.35606E-06 | 6.826E-12 | 0 | 6.47697E-06 |
| 790000 | 1.33589E-06 | 6.548E-12 | 0 | 6.35127E-06 |
| 800000 | 1.33568E-06 | 6.796E-12 | 0 | 6.44526E-06 |
| 810000 | 1.33425E-06 | 7.116E-12 | 0 | 6.56284E-06 |
| 820000 | 1.35589E-06 | 7.645E-12 | 0 | 6.77524E-06 |
| 830000 | 1.39945E-06 | 8.976E-12 | 0 | 7.27165E-06 |
| 840000 | 1.35873E-06 | 8.981E-12 | 0 | 7.23239E-06 |
| 850000 | 1.26781E-06 | 7.344E-12 | 0 | 6.57927E-06 |
| 860000 | 1.23408E-06 | 6.818E-12 | 0 | 6.35188E-06 |
| 870000 | 1.20914E-06 | 6.784E-12 | 0 | 6.3142E-06 |
| 880000 | 1.24103E-06 | 8.021E-12 | 0 | 6.79203E-06 |
| 890000 | 1.17226E-06 | 7.722E-12 | 0 | 6.61882E-06 |
| 900000 | 1.12312E-06 | 5.9E-12 | 0 | 5.88406E-06 |
| 910000 | 1.13168E-06 | 6.225E-12 | 0 | 6.02173E-06 |
| 920000 | 1.08938E-06 | 5.232E-12 | 0 | 5.57272E-06 |
| 930000 | 1.1375E-06 | 6.776E-12 | 0 | 6.23966E-06 |
| 940000 | 1.21404E-06 | 8.654E-12 | 0 | 6.98003E-06 |
| 950000 | 1.18024E-06 | 7.994E-12 | 0 | 6.72173E-06 |
| 960000 | 1.09003E-06 | 6.245E-12 | 0 | 5.98818E-06 |
| 970000 | 1.02788E-06 | 5.079E-12 | 0 | 5.4451E-06 |
| 980000 | 9.64966E-07 | 4.24E-12 | 0 | 5.00106E-06 |
| 990000 | 9.94863E-07 | 5.58E-12 | 0 | 5.62492E-06 |
| 1000000 | 1.01555E-06 | 6.105E-12 | 0 | 5.85837E-06 |
| 1010000 | 1.00709E-06 | 5.344E-12 | 0 | 5.538E-06 |
| 1020000 | 1.07284E-06 | 6.473E-12 | 0 | 6.05961E-06 |
| 1030000 | 1.06538E-06 | 5.921E-12 | 0 | 5.83483E-06 |
| 1040000 | 1.04216E-06 | 6.173E-12 | 0 | 5.91198E-06 |
| 1050000 | 1.04866E-06 | 7.881E-12 | 0 | 6.55108E-06 |

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|---|---|---|---|---|
| 1060000 | 1.02884E-06 | 6.131E-12 | 0 | 5.88199E-06 |
| 1070000 | 1.07908E-06 | 6.712E-12 | 0 | 6.15708E-06 |
| 1080000 | 1.06572E-06 | 6.781E-12 | 0 | 6.16953E-06 |
| 1090000 | 1.10503E-06 | 9.56E-12 | 0 | 7.16527E-06 |
| 1100000 | 1.08531E-06 | 7.961E-12 | 0 | 6.61536E-06 |
| 1110000 | 1.03041E-06 | 7.022E-12 | 0 | 6.22421E-06 |
| 1120000 | 9.74829E-07 | 5.492E-12 | 0 | 5.56791E-06 |
| 1130000 | 9.37842E-07 | 4.808E-12 | 0 | 5.23571E-06 |
| 1140000 | 9.29726E-07 | 4.769E-12 | 0 | 5.20996E-06 |
| 1150000 | 9.9274E-07 | 7.484E-12 | 0 | 6.35456E-06 |
| 1160000 | 9.34829E-07 | 5.272E-12 | 0 | 5.43511E-06 |
| 1170000 | 9.55788E-07 | 6.568E-12 | 0 | 5.97899E-06 |
| 1180000 | 8.94247E-07 | 5.05E-12 | 0 | 5.2989E-06 |
| 1190000 | 8.98664E-07 | 5.362E-12 | 0 | 5.43711E-06 |
| 1200000 | 8.21781E-07 | 3.492E-12 | 0 | 4.48463E-06 |
| 1210000 | 8.92123E-07 | 4.803E-12 | 0 | 5.18752E-06 |
| 1220000 | 9.42945E-07 | 6.639E-12 | 0 | 5.99326E-06 |
| 1230000 | 9.44384E-07 | 6.679E-12 | 0 | 6.00969E-06 |
| 1240000 | 9.26884E-07 | 5.912E-12 | 0 | 5.69265E-06 |
| 1250000 | 9.11473E-07 | 5.118E-12 | 0 | 5.34547E-06 |
| 1260000 | 8.90548E-07 | 4.836E-12 | 0 | 5.20079E-06 |
| 1270000 | 8.51438E-07 | 4.186E-12 | 0 | 4.86134E-06 |
| 1280000 | 8.28048E-07 | 3.83E-12 | 0 | 4.66395E-06 |
| 1290000 | 8.44418E-07 | 4.142E-12 | 0 | 4.83322E-06 |
| 1300000 | 8.62603E-07 | 4.059E-12 | 0 | 4.8115E-06 |
| 1310000 | 8.40411E-07 | 3.743E-12 | 0 | 4.63218E-06 |
| 1320000 | 7.95034E-07 | 3.316E-12 | 0 | 4.36419E-06 |
| 1330000 | 7.72808E-07 | 2.961E-12 | 0 | 4.14562E-06 |
| 1340000 | 7.03493E-07 | 2.384E-12 | 0 | 3.73006E-06 |
| 1350000 | 6.79041E-07 | 2.286E-12 | 0 | 3.64273E-06 |
| 1360000 | 7.01712E-07 | 2.703E-12 | 0 | 3.92414E-06 |
| 1370000 | 7.08938E-07 | 3.001E-12 | 0 | 4.1042E-06 |
| 1380000 | 6.92055E-07 | 2.646E-12 | 0 | 3.88026E-06 |
| 1390000 | 7.04486E-07 | 3.064E-12 | 0 | 4.13508E-06 |
| 1400000 | 6.98116E-07 | 3.764E-12 | 0 | 4.50096E-06 |
| 1410000 | 6.91267E-07 | 3.848E-12 | 0 | 4.53623E-06 |
| 1420000 | 7.14521E-07 | 3.832E-12 | 0 | 4.55139E-06 |
| 1430000 | 6.55103E-07 | 3.096E-12 | 0 | 4.10367E-06 |
| 1440000 | 5.93801E-07 | 1.649E-12 | 0 | 3.11101E-06 |
| 1450000 | 6.01678E-07 | 1.891E-12 | 0 | 3.29669E-06 |
| 1460000 | 6.2613E-07 | 2.453E-12 | 0 | 3.69599E-06 |
| 1470000 | 6.2137E-07 | 2.229E-12 | 0 | 3.54729E-06 |
| 1480000 | 5.84041E-07 | 1.666E-12 | 0 | 3.11405E-06 |
| 1490000 | 5.72842E-07 | 1.566E-12 | 0 | 3.02586E-06 |
| 1500000 | 5.90685E-07 | 1.643E-12 | 0 | 3.10316E-06 |
| 1510000 | 5.84863E-07 | 1.706E-12 | 0 | 3.14471E-06 |
| 1520000 | 6.04041E-07 | 1.842E-12 | 0 | 3.26445E-06 |
| 1530000 | 6.42534E-07 | 2.18E-12 | 0 | 3.53633E-06 |
| 1540000 | 6.28733E-07 | 2.102E-12 | 0 | 3.47018E-06 |
| 1550000 | 6.15411E-07 | 1.993E-12 | 0 | 3.38237E-06 |
| 1560000 | 6.175E-07 | 2.095E-12 | 0 | 3.45423E-06 |
| 1570000 | 6.04726E-07 | 1.819E-12 | 0 | 3.24808E-06 |
| 1580000 | 6.15548E-07 | 1.957E-12 | 0 | 3.35755E-06 |
| 1590000 | 6.02226E-07 | 2.113E-12 | 0 | 3.45157E-06 |
| 1600000 | 5.58801E-07 | 1.631E-12 | 0 | 3.06203E-06 |
| 1610000 | 5.89041E-07 | 1.982E-12 | 0 | 3.34848E-06 |

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|---|---|---|---|---|
| 1620000 | 5.95856E-07 | 2.155E-12 | 0 | 3.47309E-06 |
| 1630000 | 5.92329E-07 | 1.996E-12 | 0 | 3.36143E-06 |
| 1640000 | 5.82705E-07 | 1.855E-12 | 0 | 3.25232E-06 |
| 1650000 | 5.81712E-07 | 1.887E-12 | 0 | 3.27444E-06 |
| 1660000 | 6.07123E-07 | 2.331E-12 | 0 | 3.59974E-06 |
| 1670000 | 5.90445E-07 | 2.265E-12 | 0 | 3.54036E-06 |
| 1680000 | 5.79658E-07 | 2.24E-12 | 0 | 3.51343E-06 |
| 1690000 | 5.4226E-07 | 1.617E-12 | 0 | 3.03478E-06 |
| 1700000 | 5.14966E-07 | 1.432E-12 | 0 | 2.86042E-06 |
| 1710000 | 5.34692E-07 | 1.702E-12 | 0 | 3.09154E-06 |
| 1720000 | 5.34452E-07 | 1.631E-12 | 0 | 3.03734E-06 |
| 1730000 | 5.45856E-07 | 1.984E-12 | 0 | 3.30686E-06 |
| 1740000 | 5.56301E-07 | 2.033E-12 | 0 | 3.35124E-06 |
| 1750000 | 5.45034E-07 | 1.826E-12 | 0 | 3.19336E-06 |
| 1760000 | 5.55479E-07 | 2.19E-12 | 0 | 3.45625E-06 |
| 1770000 | 5.69212E-07 | 2.349E-12 | 0 | 3.57334E-06 |
| 1780000 | 5.56644E-07 | 2.109E-12 | 0 | 3.40326E-06 |
| 1790000 | 5.33836E-07 | 1.888E-12 | 0 | 3.22673E-06 |
| 1800000 | 5.25856E-07 | 1.858E-12 | 0 | 3.19783E-06 |
| 1810000 | 5.06986E-07 | 1.556E-12 | 0 | 2.95187E-06 |
| 1820000 | 5.10548E-07 | 1.519E-12 | 0 | 2.92643E-06 |
| 1830000 | 5.06233E-07 | 1.565E-12 | 0 | 2.95823E-06 |
| 1840000 | 5.31541E-07 | 1.792E-12 | 0 | 3.15496E-06 |
| 1850000 | 5.39384E-07 | 1.886E-12 | 0 | 3.23089E-06 |
| 1860000 | 5.11747E-07 | 1.741E-12 | 0 | 3.0982E-06 |
| 1870000 | 5.38973E-07 | 2.286E-12 | 0 | 3.50223E-06 |
| 1880000 | 5.28082E-07 | 1.991E-12 | 0 | 3.29357E-06 |
| 1890000 | 5.11267E-07 | 1.736E-12 | 0 | 3.09384E-06 |
| 1900000 | 4.95171E-07 | 1.597E-12 | 0 | 2.97241E-06 |
| 1910000 | 5.02534E-07 | 1.689E-12 | 0 | 3.05008E-06 |
| 1920000 | 5.01541E-07 | 1.433E-12 | 0 | 2.84751E-06 |
| 1930000 | 5.11404E-07 | 1.459E-12 | 0 | 2.87832E-06 |
| 1950000 | 5.30205E-07 | 1.899E-12 | 0 | 3.23124E-06 |
| 1960000 | 5.15719E-07 | 1.738E-12 | 0 | 3.09995E-06 |
| 1970000 | 4.88219E-07 | 1.494E-12 | 0 | 2.8837E-06 |
| 1980000 | 4.77945E-07 | 1.328E-12 | 0 | 2.73666E-06 |
| 1990000 | 4.85959E-07 | 1.458E-12 | 0 | 2.85237E-06 |
| 2000000 | 5.01267E-07 | 1.625E-12 | 0 | 2.99973E-06 |
| 2010000 | 5.05548E-07 | 1.683E-12 | 0 | 3.04848E-06 |
| 2020000 | 4.87842E-07 | 1.473E-12 | 0 | 2.8665E-06 |
| 2030000 | 4.68699E-07 | 1.278E-12 | 0 | 2.68481E-06 |
| 2040000 | 4.85993E-07 | 1.436E-12 | 0 | 2.83488E-06 |
| 2050000 | 4.96781E-07 | 1.5E-12 | 0 | 2.89743E-06 |
| 2060000 | 4.97637E-07 | 1.604E-12 | 0 | 2.98027E-06 |
| 2070000 | 4.99452E-07 | 1.662E-12 | 0 | 3.02591E-06 |
| 2080000 | 5.10205E-07 | 1.821E-12 | 0 | 3.15517E-06 |
| 2090000 | 5.07295E-07 | 1.757E-12 | 0 | 3.10509E-06 |
| 2100000 | 5.0024E-07 | 1.623E-12 | 0 | 2.99685E-06 |
| 2110000 | 4.86233E-07 | 1.444E-12 | 0 | 2.84116E-06 |
| 2120000 | 4.87466E-07 | 1.44E-12 | 0 | 2.83962E-06 |
| 2130000 | 4.93527E-07 | 1.596E-12 | 0 | 2.96931E-06 |
| 2140000 | 5.00479E-07 | 1.69E-12 | 0 | 3.0488E-06 |
| 2150000 | 4.83253E-07 | 1.583E-12 | 0 | 2.94914E-06 |
| 2160000 | 4.95959E-07 | 1.912E-12 | 0 | 3.20633E-06 |
| 2170000 | 5.07842E-07 | 1.921E-12 | 0 | 3.22464E-06 |
| 2180000 | 5.12055E-07 | 1.9E-12 | 0 | 3.21369E-06 |

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|---|---|---|---|---|
| 2190000 | 5.18767E-07 | 1.813E-12 | 0 | 3.1581E-06 |
| 2200000 | 5.14041E-07 | 1.681E-12 | 0 | 3.05515E-06 |
| 2210000 | 5.14281E-07 | 1.793E-12 | 0 | 3.13873E-06 |
| 2220000 | 4.84897E-07 | 1.492E-12 | 0 | 2.87894E-06 |
| 2230000 | 4.84384E-07 | 1.562E-12 | 0 | 2.93429E-06 |
| 2240000 | 4.65753E-07 | 1.391E-12 | 0 | 2.77743E-06 |
| 2250000 | 4.41267E-07 | 1.163E-12 | 0 | 2.55472E-06 |
| 2260000 | 4.47774E-07 | 1.31E-12 | 0 | 2.69115E-06 |
| 2270000 | 4.575E-07 | 1.594E-12 | 0 | 2.9323E-06 |
| 2280000 | 4.52945E-07 | 1.469E-12 | 0 | 2.82837E-06 |
| 2290000 | 4.34349E-07 | 1.284E-12 | 0 | 2.65521E-06 |
| 2300000 | 4.13562E-07 | 1.062E-12 | 0 | 2.43315E-06 |
| 2310000 | 4.0589E-07 | 1.066E-12 | 0 | 2.42915E-06 |
| 2320000 | 4.07432E-07 | 1.082E-12 | 0 | 2.44642E-06 |
| 2330000 | 4.10411E-07 | 1.196E-12 | 0 | 2.55414E-06 |
| 2340000 | 4.21027E-07 | 1.32E-12 | 0 | 2.67254E-06 |
| 2350000 | 4.16747E-07 | 1.268E-12 | 0 | 2.62366E-06 |
| 2360000 | 4.37945E-07 | 1.791E-12 | 0 | 3.06094E-06 |
| 2370000 | 4.28014E-07 | 1.826E-12 | 0 | 3.0766E-06 |
| 2380000 | 4.10411E-07 | 1.845E-12 | 0 | 3.07266E-06 |
| 2390000 | 3.77432E-07 | 1.058E-12 | 0 | 2.39359E-06 |
| 2400000 | 3.70719E-07 | 9.17E-13 | 0 | 2.24741E-06 |
| 2410000 | 3.66062E-07 | 1.028E-12 | 0 | 2.35372E-06 |
| 2420000 | 3.73425E-07 | 1.094E-12 | 0 | 2.42359E-06 |
| 2430000 | 3.74658E-07 | 1.167E-12 | 0 | 2.4922E-06 |
| 2440000 | 3.68699E-07 | 1.141E-12 | 0 | 2.46265E-06 |
| 2450000 | 3.68014E-07 | 1.063E-12 | 0 | 2.38855E-06 |
| 2460000 | 3.8161E-07 | 1.15E-12 | 0 | 2.48388E-06 |
| 2470000 | 3.92295E-07 | 1.284E-12 | 0 | 2.61327E-06 |
| 2480000 | 4.07295E-07 | 1.419E-12 | 0 | 2.74212E-06 |
| 2490000 | 4.02979E-07 | 1.389E-12 | 0 | 2.71292E-06 |
| 2500000 | 3.88356E-07 | 1.211E-12 | 0 | 2.54525E-06 |

**Appendix H. Prediction of mean, variance and upper bound of total solute flux for nonreactive solute with source location at bottom layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 15 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 |
| 45 | 0 | 0 | 0 | 0 |
| 60 | 0.001509932 | 0.000338185 | 0 | 0.03755398 |
| 75 | 0.006017329 | 0.001723062 | 0 | 0.087376496 |
| 90 | 0.006538562 | 0.001191057 | 0 | 0.074181492 |
| 105 | 0.005108493 | 0.000745886 | 0 | 0.058637898 |
| 120 | 0.00748379 | 0.000961913 | 0 | 0.068272648 |
| 135 | 0.009379247 | 0.001304968 | 0 | 0.080182969 |
| 150 | 0.007559703 | 0.000728808 | 0 | 0.060472718 |
| 165 | 0.007172991 | 0.000722928 | 0 | 0.059872145 |
| 180 | 0.006201142 | 0.000394709 | 0 | 0.045141036 |
| 195 | 0.007061712 | 0.000560171 | 0 | 0.053450845 |
| 210 | 0.007570183 | 0.000581921 | 0 | 0.054851357 |
| 225 | 0.008006073 | 0.000578796 | 0 | 0.055160115 |
| 240 | 0.007444635 | 0.00041589 | 0 | 0.047415646 |
| 255 | 0.00787863 | 0.000489664 | 0 | 0.05125019 |
| 270 | 0.008302671 | 0.000543744 | 0 | 0.054006587 |
| 285 | 0.007885411 | 0.000426645 | 0 | 0.048369986 |
| 300 | 0.00768395 | 0.000381118 | 0 | 0.045947561 |
| 315 | 0.007458105 | 0.000291535 | 0 | 0.040923922 |
| 330 | 0.00732395 | 0.000295716 | 0 | 0.0410289 |
| 345 | 0.007553995 | 0.00033296 | 0 | 0.043318507 |
| 360 | 0.007310183 | 0.000299187 | 0 | 0.041212347 |
| 375 | 0.007076164 | 0.000248919 | 0 | 0.037999407 |
| 390 | 0.007254155 | 0.000254323 | 0 | 0.038511263 |
| 405 | 0.007480274 | 0.000272575 | 0 | 0.039839547 |
| 420 | 0.007186667 | 0.000260893 | 0 | 0.038844932 |
| 435 | 0.006557717 | 0.000176211 | 0 | 0.032575621 |
| 450 | 0.006837511 | 0.000214117 | 0 | 0.035517694 |
| 465 | 0.006921484 | 0.000238533 | 0 | 0.037192709 |
| 480 | 0.006234566 | 0.000191652 | 0 | 0.033368532 |
| 495 | 0.005898813 | 0.000163079 | 0 | 0.030928452 |
| 510 | 0.005712397 | 0.000158773 | 0 | 0.03040939 |
| 525 | 0.005574384 | 0.000140636 | 0 | 0.028818023 |
| 540 | 0.005618196 | 0.000185227 | 0 | 0.032293456 |
| 555 | 0.005884018 | 0.000170788 | 0 | 0.031498482 |
| 570 | 0.005670571 | 0.000136887 | 0 | 0.028602286 |
| 585 | 0.005648836 | 0.000138571 | 0 | 0.028721234 |
| 600 | 0.006009087 | 0.000169552 | 0 | 0.031530654 |
| 615 | 0.005814977 | 0.000159812 | 0 | 0.030592655 |
| 630 | 0.005279041 | 0.0001266 | 0 | 0.027332342 |
| 645 | 0.004877306 | 0.000110737 | 0 | 0.025502747 |
| 660 | 0.004669452 | 9.76E-05 | 0 | 0.024035465 |
| 675 | 0.004380594 | 7.60E-05 | 0 | 0.021461964 |
| 690 | 0.004303242 | 8.13E-05 | 0 | 0.021970755 |
| 705 | 0.004203836 | 7.36E-05 | 0 | 0.021022431 |
| 720 | 0.004011712 | 6.39E-05 | 0 | 0.019675596 |

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|---|---|---|---|---|
| 735 | 0.004094064 | 7.08E-05 | 0 | 0.020583513 |
| 750 | 0.004331986 | 8.62E-05 | 0 | 0.022524144 |
| 765 | 0.004408516 | 9.21E-05 | 0 | 0.023221783 |
| 780 | 0.004572648 | 9.77E-05 | 0 | 0.023944418 |
| 795 | 0.004421027 | 9.44E-05 | 0 | 0.02346094 |
| 810 | 0.004141438 | 8.55E-05 | 0 | 0.022269858 |
| 825 | 0.004186393 | 8.30E-05 | 0 | 0.022040026 |
| 840 | 0.00401137 | 7.99E-05 | 0 | 0.021536351 |
| 855 | 0.003709018 | 6.81E-05 | 0 | 0.019881087 |
| 870 | 0.003513562 | 6.35E-05 | 0 | 0.019137233 |
| 885 | 0.003455228 | 5.71E-05 | 0 | 0.018269805 |
| 900 | 0.003323493 | 5.42E-05 | 0 | 0.017748901 |
| 915 | 0.0032279 | 5.41E-05 | 0 | 0.017648707 |
| 930 | 0.003089612 | 5.05E-05 | 0 | 0.017020422 |
| 945 | 0.002846849 | 4.15E-05 | 0 | 0.015465896 |
| 960 | 0.002821872 | 3.97E-05 | 0 | 0.015164714 |
| 975 | 0.002845525 | 4.79E-05 | 0 | 0.016408605 |
| 990 | 0.00281153 | 4.59E-05 | 0 | 0.016097169 |
| 1005 | 0.003039543 | 5.97E-05 | 0 | 0.018188087 |
| 1020 | 0.003172443 | 6.53E-05 | 0 | 0.019009025 |
| 1035 | 0.003035662 | 5.91E-05 | 0 | 0.018109483 |
| 1050 | 0.002746667 | 4.49E-05 | 0 | 0.015885696 |
| 1065 | 0.002586256 | 4.19E-05 | 0 | 0.015267672 |
| 1080 | 0.002452352 | 3.85E-05 | 0 | 0.014608008 |
| 1095 | 0.002338676 | 3.57E-05 | 0 | 0.014053408 |
| 1110 | 0.002190731 | 2.98E-05 | 0 | 0.012893754 |
| 1125 | 0.00211484 | 2.71E-05 | 0 | 0.012323386 |
| 1140 | 0.002144452 | 2.80E-05 | 0 | 0.012518389 |
| 1155 | 0.002121233 | 2.91E-05 | 0 | 0.012699812 |
| 1170 | 0.002092511 | 2.86E-05 | 0 | 0.0125718 |
| 1185 | 0.002069772 | 2.91E-05 | 0 | 0.012645762 |
| 1200 | 0.002061575 | 2.99E-05 | 0 | 0.012782561 |
| 1215 | 0.001981507 | 2.87E-05 | 0 | 0.012479975 |
| 1230 | 0.001846461 | 2.54E-05 | 0 | 0.011732077 |
| 1245 | 0.001820685 | 2.61E-05 | 0 | 0.011837202 |
| 1260 | 0.001724749 | 2.31E-05 | 0 | 0.011152116 |
| 1275 | 0.001689635 | 2.38E-05 | 0 | 0.011250931 |
| 1290 | 0.001638539 | 2.18E-05 | 0 | 0.010796088 |
| 1305 | 0.00155153 | 2.16E-05 | 0 | 0.010655441 |
| 1320 | 0.001384932 | 1.61E-05 | 0 | 0.009237546 |
| 1335 | 0.001339224 | 1.46E-05 | 0 | 0.008838559 |
| 1350 | 0.001302146 | 1.35E-05 | 0 | 0.008511934 |
| 1365 | 0.001324566 | 1.50E-05 | 0 | 0.008919806 |
| 1380 | 0.001380228 | 1.94E-05 | 0 | 0.010010886 |
| 1395 | 0.001294475 | 1.84E-05 | 0 | 0.009697421 |
| 1410 | 0.001215868 | 1.67E-05 | 0 | 0.009234906 |
| 1425 | 0.001168584 | 1.48E-05 | 0 | 0.008718208 |
| 1440 | 0.001040502 | 9.52E-06 | 0 | 0.007089075 |
| 1455 | 0.000935365 | 7.37E-06 | 0 | 0.006254903 |
| 1470 | 0.000922922 | 7.46E-06 | 0 | 0.006274681 |
| 1485 | 0.000914658 | 9.88E-06 | 0 | 0.007076178 |
| 1500 | 0.00087589 | 7.65E-06 | 0 | 0.006295787 |
| 1515 | 0.000918379 | 7.79E-06 | 0 | 0.006388368 |
| 1530 | 0.000903447 | 7.14E-06 | 0 | 0.006139388 |
| 1545 | 0.000841256 | 7.08E-06 | 0 | 0.006055592 |
| 1560 | 0.000780183 | 5.90E-06 | 0 | 0.005539418 |

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|---|---|---|---|---|
| 1575 | 0.000776187 | 6.15E-06 | 0 | 0.005636119 |
| 1590 | 0.000684429 | 4.84E-06 | 0 | 0.004997181 |
| 1605 | 0.000701758 | 5.10E-06 | 0 | 0.00512981 |
| 1620 | 0.000737489 | 7.38E-06 | 0 | 0.006061976 |
| 1635 | 0.000662991 | 4.96E-06 | 0 | 0.005030155 |
| 1650 | 0.000693128 | 5.45E-06 | 0 | 0.005267088 |
| 1665 | 0.000711941 | 6.29E-06 | 0 | 0.005625927 |
| 1680 | 0.000757443 | 8.52E-06 | 0 | 0.006479949 |
| 1695 | 0.000733699 | 8.72E-06 | 0 | 0.006522846 |
| 1710 | 0.000704315 | 7.75E-06 | 0 | 0.006160888 |
| 1725 | 0.000651461 | 5.64E-06 | 0 | 0.005305954 |
| 1740 | 0.00061484 | 5.06E-06 | 0 | 0.005023404 |
| 1755 | 0.000606073 | 5.37E-06 | 0 | 0.005147278 |
| 1770 | 0.000609863 | 5.07E-06 | 0 | 0.005022836 |
| 1785 | 0.000660502 | 6.30E-06 | 0 | 0.005581869 |
| 1800 | 0.00068621 | 7.00E-06 | 0 | 0.005871138 |
| 1815 | 0.00073105 | 8.66E-06 | 0 | 0.006500362 |
| 1830 | 0.000677374 | 7.11E-06 | 0 | 0.005902595 |
| 1845 | 0.000551621 | 4.40E-06 | 0 | 0.004661466 |
| 1860 | 0.000552237 | 5.12E-06 | 0 | 0.004986817 |
| 1875 | 0.000528721 | 4.23E-06 | 0 | 0.004557765 |
| 1890 | 0.000533402 | 4.51E-06 | 0 | 0.004697228 |
| 1905 | 0.000576142 | 5.84E-06 | 0 | 0.005311805 |
| 1920 | 0.000553836 | 5.56E-06 | 0 | 0.005174567 |
| 1935 | 0.000538014 | 5.29E-06 | 0 | 0.005045987 |
| 1950 | 0.000599018 | 7.72E-06 | 0 | 0.006046094 |
| 1965 | 0.000570091 | 7.51E-06 | 0 | 0.00594082 |
| 1980 | 0.000555205 | 6.22E-06 | 0 | 0.005444708 |
| 1995 | 0.000562671 | 5.97E-06 | 0 | 0.005351705 |
| 2010 | 0.000526484 | 5.34E-06 | 0 | 0.005057659 |
| 2025 | 0.000467283 | 3.64E-06 | 0 | 0.004208213 |
| 2040 | 0.00050847 | 4.86E-06 | 0 | 0.004828548 |
| 2055 | 0.000520936 | 5.49E-06 | 0 | 0.005113645 |
| 2070 | 0.000477808 | 4.14E-06 | 0 | 0.004465686 |
| 2085 | 0.000449772 | 3.56E-06 | 0 | 0.004147538 |
| 2100 | 0.000467968 | 4.07E-06 | 0 | 0.004423132 |
| 2115 | 0.000480251 | 4.66E-06 | 0 | 0.004709075 |
| 2130 | 0.000441073 | 3.50E-06 | 0 | 0.004109625 |
| 2145 | 0.00040589 | 2.85E-06 | 0 | 0.003713609 |
| 2160 | 0.000412831 | 2.97E-06 | 0 | 0.003789133 |
| 2175 | 0.000416461 | 3.05E-06 | 0 | 0.003841479 |
| 2190 | 0.000396484 | 3.01E-06 | 0 | 0.003794615 |
| 2205 | 0.000390183 | 3.03E-06 | 0 | 0.003803486 |
| 2220 | 0.000402009 | 3.17E-06 | 0 | 0.003893454 |
| 2235 | 0.000401256 | 3.03E-06 | 0 | 0.003811575 |
| 2250 | 0.000424772 | 4.12E-06 | 0 | 0.004401777 |
| 2265 | 0.000367648 | 2.53E-06 | 0 | 0.003486128 |
| 2280 | 0.000362055 | 2.63E-06 | 0 | 0.003542513 |
| 2295 | 0.000348767 | 2.44E-06 | 0 | 0.003412187 |
| 2310 | 0.000336849 | 2.42E-06 | 0 | 0.003383908 |
| 2325 | 0.000317694 | 2.35E-06 | 0 | 0.003324378 |
| 2340 | 0.000292694 | 1.77E-06 | 0 | 0.002900677 |
| 2355 | 0.000276119 | 1.61E-06 | 0 | 0.002763328 |
| 2370 | 0.000258721 | 1.34E-06 | 0 | 0.002530377 |
| 2385 | 0.000265502 | 1.50E-06 | 0 | 0.002665556 |
| 2400 | 0.000237078 | 1.08E-06 | 0 | 0.002277622 |

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|---|---|---|---|---|
| 2415 | 0.000223447 | 1.03E-06 | 0 | 0.002213259 |
| 2430 | 0.000206187 | 9.52E-07 | 0 | 0.002118163 |
| 2445 | 0.000199589 | 9.13E-07 | 0 | 0.00207288 |
| 2460 | 0.000202443 | 1.03E-06 | 0 | 0.002191787 |
| 2475 | 0.000188402 | 7.67E-07 | 0 | 0.001905123 |
| 2490 | 0.000176484 | 7.04E-07 | 0 | 0.001821178 |
| 2505 | 0.000173858 | 6.98E-07 | 0 | 0.001811531 |
| 2520 | 0.000172374 | 6.80E-07 | 0 | 0.001788396 |
| 2535 | 0.000170845 | 6.67E-07 | 0 | 0.001771698 |
| 2550 | 0.00016895 | 6.51E-07 | 0 | 0.001750956 |
| 2565 | 0.000158744 | 5.63E-07 | 0 | 0.001629719 |
| 2580 | 0.000164315 | 6.09E-07 | 0 | 0.001693973 |
| 2595 | 0.000181918 | 8.24E-07 | 0 | 0.001960983 |
| 2610 | 0.000182877 | 9.21E-07 | 0 | 0.002063647 |
| 2625 | 0.000171598 | 7.23E-07 | 0 | 0.001837949 |
| 2640 | 0.000144954 | 4.52E-07 | 0 | 0.001463282 |
| 2655 | 0.000133082 | 4.00E-07 | 0 | 0.001373186 |
| 2670 | 0.000126872 | 3.66E-07 | 0 | 0.001312399 |
| 2685 | 0.000130434 | 3.89E-07 | 0 | 0.0013536 |
| 2700 | 0.000125548 | 3.72E-07 | 0 | 0.001321551 |
| 2715 | 0.000119954 | 3.44E-07 | 0 | 0.001269802 |
| 2730 | 0.000133288 | 4.55E-07 | 0 | 0.001455219 |
| 2745 | 0.000134452 | 4.58E-07 | 0 | 0.001460371 |
| 2760 | 0.000127009 | 4.18E-07 | 0 | 0.001394077 |
| 2775 | 0.00013589 | 5.26E-07 | 0 | 0.001557437 |
| 2790 | 0.000134909 | 5.78E-07 | 0 | 0.001624384 |
| 2805 | 0.000115502 | 3.70E-07 | 0 | 0.001307166 |
| 2820 | 0.000112717 | 3.57E-07 | 0 | 0.00128419 |
| 2835 | 0.000115616 | 4.41E-07 | 0 | 0.00141765 |
| 2850 | 0.000108653 | 3.54E-07 | 0 | 0.001275008 |
| 2865 | 0.000105479 | 3.37E-07 | 0 | 0.001243712 |
| 2880 | 0.000108676 | 3.46E-07 | 0 | 0.001261656 |
| 2895 | 0.000111142 | 3.56E-07 | 0 | 0.00128037 |
| 2910 | 0.000104886 | 3.59E-07 | 0 | 0.001279194 |
| 2925 | 9.77E-05 | 3.21E-07 | 0 | 0.001207936 |
| 2940 | 9.77E-05 | 3.03E-07 | 0 | 0.001176443 |
| 2955 | 0.000104863 | 3.77E-07 | 0 | 0.001308511 |
| 2970 | 0.000116689 | 5.75E-07 | 0 | 0.001603364 |
| 2985 | 0.000110959 | 4.44E-07 | 0 | 0.001417093 |
| 3000 | 0.000105388 | 3.73E-07 | 0 | 0.001303065 |
| 3015 | 0.000111279 | 5.09E-07 | 0 | 0.00150898 |
| 3030 | 0.000111804 | 5.68E-07 | 0 | 0.001589001 |
| 3045 | 0.000112374 | 5.75E-07 | 0 | 0.001598233 |
| 3060 | 0.000110776 | 5.33E-07 | 0 | 0.001541353 |
| 3075 | 0.000111438 | 5.65E-07 | 0 | 0.00158429 |
| 3090 | 0.000104863 | 5.11E-07 | 0 | 0.00150594 |
| 3105 | 9.89E-05 | 4.72E-07 | 0 | 0.001444803 |
| 3120 | 9.29E-05 | 4.60E-07 | 0 | 0.001422801 |
| 3135 | 8.51E-05 | 4.35E-07 | 0 | 0.001377611 |
| 3150 | 7.74E-05 | 3.72E-07 | 0 | 0.001273178 |
| 3165 | 7.22E-05 | 3.19E-07 | 0 | 0.001179643 |
| 3180 | 7.11E-05 | 3.36E-07 | 0 | 0.001207221 |
| 3195 | 7.21E-05 | 3.35E-07 | 0 | 0.001206241 |
| 3210 | 6.66E-05 | 2.87E-07 | 0 | 0.001116405 |
| 3225 | 6.95E-05 | 2.90E-07 | 0 | 0.001125006 |
| 3240 | 6.18E-05 | 2.21E-07 | 0 | 0.00098407 |

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|---|---|---|---|---|
| 3255 | 5.72E-05 | 1.82E-07 | 0 | 0.000893166 |
| 3270 | 5.88E-05 | 1.79E-07 | 0 | 0.000888881 |
| 3285 | 5.95E-05 | 2.00E-07 | 0 | 0.000936819 |
| 3300 | 5.57E-05 | 1.89E-07 | 0 | 0.000907259 |
| 3315 | 5.49E-05 | 1.82E-07 | 0 | 0.000890898 |
| 3330 | 5.59E-05 | 1.98E-07 | 0 | 0.000928056 |
| 3345 | 5.55E-05 | 1.16E-07 | 0 | 0.000967036 |
| 3360 | 5.35E-05 | 1.80E-07 | 0 | 0.000885475 |
| 3375 | 5.02E-05 | 1.46E-07 | 0 | 0.00079872 |
| 3390 | 4.68E-05 | 1.22E-07 | 0 | 0.00073103 |
| 3405 | 4.73E-05 | 1.26E-07 | 0 | 0.000743266 |
| 3420 | 4.65E-05 | 1.23E-07 | 0 | 0.000733397 |
| 3435 | 4.48E-05 | 1.07E-07 | 0 | 0.000687254 |
| 3450 | 4.51E-05 | 1.13E-07 | 0 | 0.000702806 |
| 3465 | 4.51E-05 | 1.12E-07 | 0 | 0.000700889 |
| 3480 | 3.99E-05 | 8.65E-08 | 0 | 0.00061642 |
| 3495 | 3.48E-05 | 6.80E-08 | 0 | 0.000545958 |
| 3510 | 3.43E-05 | 6.54E-08 | 0 | 0.000535398 |
| 3525 | 3.57E-05 | 7.46E-08 | 0 | 0.000571013 |
| 3540 | 3.67E-05 | 8.51E-08 | 0 | 0.000608632 |
| 3555 | 3.05E-05 | 5.47E-08 | 0 | 0.000489063 |
| 3570 | 2.74E-05 | 4.44E-08 | 0 | 0.000440469 |
| 3585 | 2.69E-05 | 4.41E-08 | 0 | 0.000438639 |
| 3600 | 2.58E-05 | 3.83E-08 | 0 | 0.000409143 |
| 3615 | 2.39E-05 | 3.42E-08 | 0 | 0.000386348 |
| 3630 | 2.20E-05 | 2.83E-08 | 0 | 0.000351817 |
| 3645 | 2.14E-05 | 2.88E-08 | 0 | 0.00035393 |
| 3660 | 2.11E-05 | 2.51E-08 | 0 | 0.000331637 |
| 3675 | 1.88E-05 | 2.07E-08 | 0 | 0.000300856 |
| 3690 | 1.82E-05 | 2.01E-08 | 0 | 0.00029623 |
| 3705 | 1.66E-05 | 1.82E-08 | 0 | 0.000281033 |
| 3720 | 1.87E-05 | 2.30E-08 | 0 | 0.000316035 |
| 3735 | 1.80E-05 | 2.05E-08 | 0 | 0.000298675 |
| 3750 | 1.74E-05 | 195E-08 | 0 | 0.000290977 |

**Appendix I. Prediction of mean, variance and upper bound of total solute flux for weak-sorption solute with source location at bottom layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE | Lower Bound (Kg/yr) | Upper Bound (Kg/yr) |
|---|---|---|---|---|
| 200 | 0 | 0 | 0 | 0 |
| 400 | 2.95565E-05 | 2.20511E-07 | 0 | 0.000949946 |
| 600 | 0.000258868 | 4.90409E-06 | 0 | 0.004599325 |
| 800 | 0.000436461 | 7.37857E-06 | 0 | 0.00576051 |
| 1000 | 0.000459587 | 6.24112E-06 | 0 | 0.005356105 |
| 1200 | 0.000345635 | 2.48819E-06 | 0 | 0.003437341 |
| 1400 | 0.000576043 | 6.27376E-06 | 0 | 0.005485346 |
| 1600 | 0.00067375 | 6.30053E-06 | 0 | 0.005593519 |
| 1800 | 0.000495884 | 3.0769E-06 | 0 | 0.003933939 |
| 2000 | 0.000532779 | 3.88274E-06 | 0 | 0.004394893 |
| 2200 | 0.000472074 | 2.37001E-06 | 0 | 0.003489461 |
| 2400 | 0.000518354 | 3.01961E-06 | 0 | 0.003924251 |
| 2600 | 0.000541897 | 3.03205E-06 | 0 | 0.003954803 |
| 2800 | 0.000549014 | 2.66617E-06 | 0 | 0.003749384 |
| 3000 | 0.000504736 | 2.0132E-06 | 0 | 0.003285728 |
| 3200 | 0.00057205 | 2.74597E-06 | 0 | 0.003819957 |
| 3400 | 0.000577247 | 2.3823E-06 | 0 | 0.00360245 |
| 3600 | 0.000571432 | 2.45333E-06 | 0 | 0.0036414 |
| 3800 | 0.000552558 | 2.08347E-06 | 0 | 0.00338167 |
| 4000 | 0.000540363 | 1.78005E-06 | 0 | 0.003155368 |
| 4200 | 0.000529024 | 1.53361E-06 | 0 | 0.00295627 |
| 4400 | 0.000546558 | 1.69297E-06 | 0 | 0.003096794 |
| 4600 | 0.000514546 | 1.48758E-06 | 0 | 0.002905086 |
| 4800 | 0.00052692 | 1.58944E-06 | 0 | 0.00299795 |
| 5000 | 0.000498596 | 1.17485E-06 | 0 | 0.002623047 |
| 5200 | 0.000514729 | 1.36054E-06 | 0 | 0.002800917 |
| 5400 | 0.000528661 | 1.3956E-06 | 0 | 0.002844116 |
| 5600 | 0.000502529 | 1.18183E-06 | 0 | 0.002633283 |
| 5800 | 0.000463087 | 9.16032E-07 | 0 | 0.002338995 |
| 6000 | 0.00048337 | 1.05126E-06 | 0 | 0.002492978 |
| 6200 | 0.000489885 | 1.2461E-06 | 0 | 0.002677814 |
| 6400 | 0.000448586 | 9.74497E-07 | 0 | 0.002383432 |
| 6600 | 0.000424798 | 9.10877E-07 | 0 | 0.00229542 |
| 6800 | 0.000413808 | 8.26065E-07 | 0 | 0.002195215 |
| 7000 | 0.000400281 | 7.24822E-07 | 0 | 0.002068956 |
| 7200 | 0.000396572 | 8.81175E-07 | 0 | 0.002236442 |
| 7400 | 0.000399187 | 8.09219E-07 | 0 | 0.002162336 |
| 7600 | 0.000431291 | 9.04079E-07 | 0 | 0.00229492 |
| 7800 | 0.000405281 | 6.89684E-07 | 0 | 0.002033006 |
| 8000 | 0.000414856 | 7.62029E-07 | 0 | 0.002125824 |
| 8200 | 0.000441923 | 9.60289E-07 | 0 | 0.002362612 |
| 8400 | 0.000398204 | 7.37723E-07 | 0 | 0.002081663 |
| 8600 | 0.000357639 | 5.53747E-07 | 0 | 0.001816157 |
| 8800 | 0.000350771 | 6.39547E-07 | 0 | 0.001918216 |
| 9000 | 0.000317214 | 4.06871E-07 | 0 | 0.001567428 |
| 9200 | 0.000307827 | 3.70072E-07 | 0 | 0.001500164 |
| 9400 | 0.000307116 | 4.13554E-07 | 0 | 0.001567556 |
| 9600 | 0.000295853 | 3.55501E-07 | 0 | 0.001464481 |
| 9800 | 0.000283171 | 3.25706E-07 | 0 | 0.001401756 |

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|---|---|---|---|---|
| 10000 | 0.000291409 | 3.69845E-07 | 0 | 0.001483381 |
| 10200 | 0.00031262 | 4.42755E-07 | 0 | 0.001616801 |
| 10400 | 0.00032081 | 4.93723E-07 | 0 | 0.001698013 |
| 10600 | 0.000323527 | 4.816E-07 | 0 | 0.001683716 |
| 10800 | 0.000318651 | 4.77669E-07 | 0 | 0.001673278 |
| 11000 | 0.000296217 | 4.60051E-07 | 0 | 0.001625627 |
| 11200 | 0.000297533 | 4.15436E-07 | 0 | 0.001560837 |
| 11400 | 0.000294034 | 4.36061E-07 | 0 | 0.001588319 |
| 11600 | 0.000269 | 3.561E-07 | 0 | 0.001438613 |
| 11800 | 0.000254312 | 3.2616E-07 | 0 | 0.001373676 |
| 12000 | 0.000247808 | 3.09262E-07 | 0 | 0.001337791 |
| 12200 | 0.000242534 | 2.84136E-07 | 0 | 0.0012873 |
| 12400 | 0.000231844 | 2.75203E-07 | 0 | 0.001260056 |
| 12600 | 0.000232538 | 2.89246E-07 | 0 | 0.001286657 |
| 12800 | 0.000211604 | 2.36702E-07 | 0 | 0.001165184 |
| 13000 | 0.00020176 | 1.9862E-07 | 0 | 0.001075269 |
| 13200 | 0.000202779 | 2.20614E-07 | 0 | 0.001123383 |
| 13400 | 0.000206397 | 2.59539E-07 | 0 | 0.001204918 |
| 13600 | 0.000207289 | 2.71215E-07 | 0 | 0.001228025 |
| 13800 | 0.000212 | 2.74219E-07 | 0 | 0.001238371 |
| 14000 | 0.000229586 | 3.47572E-07 | 0 | 0.001385108 |
| 14200 | 0.000214437 | 2.88251E-07 | 0 | 0.001266741 |
| 14400 | 0.00020117 | 2.44532E-07 | 0 | 0.001170394 |
| 14600 | 0.000189068 | 2.29896E-07 | 0 | 0.001128838 |
| 14800 | 0.000174378 | 1.92688E-07 | 0 | 0.001034745 |
| 15000 | 0.000164435 | 1.76494E-07 | 0 | 0.000987854 |
| 15200 | 0.000156829 | 1.52049E-07 | 0 | 0.0009211 |
| 15400 | 0.000150128 | 1.38186E-07 | 0 | 0.000878726 |
| 15600 | 0.000152255 | 1.37156E-07 | 0 | 0.000878132 |
| 15800 | 0.000152365 | 1.47124E-07 | 0 | 0.000904156 |
| 16000 | 0.000150007 | 1.47684E-07 | 0 | 0.000903229 |
| 16200 | 0.000147533 | 1.43618E-07 | 0 | 0.000890313 |
| 16400 | 0.000151658 | 1.63866E-07 | 0 | 0.000945074 |
| 16600 | 0.000142622 | 1.48428E-07 | 0 | 0.000897738 |
| 16800 | 0.000138889 | 1.44599E-07 | 0 | 0.000884203 |
| 17000 | 0.000130568 | 1.27638E-07 | 0 | 0.000830807 |
| 17200 | 0.000127493 | 1.27425E-07 | 0 | 0.000827146 |
| 17400 | 0.000123318 | 1.22974E-07 | 0 | 0.000810645 |
| 17600 | 0.000122272 | 1.22995E-07 | 0 | 0.000809656 |
| 17800 | 0.00011787 | 1.13638E-07 | 0 | 0.000778589 |
| 18000 | 0.000106209 | 1.02039E-07 | 0 | 0.000732302 |
| 18200 | 9.76747E-05 | 7.97952E-08 | 0 | 0.000651336 |
| 18400 | 9.54452E-05 | 7.4701E-08 | 0 | 0.000631142 |
| 18600 | 9.37825E-05 | 7.08039E-08 | 0 | 0.000615319 |
| 18800 | 9.85445E-05 | 8.67364E-08 | 0 | 0.000675785 |
| 19000 | 9.94229E-05 | 1.01845E-07 | 0 | 0.000724919 |
| 19200 | 9.17158E-05 | 9.15229E-08 | 0 | 0.00068467 |
| 19400 | 8.79829E-05 | 9.08624E-08 | 0 | 0.000678793 |
| 19600 | 8.24281E-05 | 6.87009E-08 | 0 | 0.000596161 |
| 19800 | 7.32038E-05 | 4.6474E-08 | 0 | 0.000495737 |
| 20000 | 6.7089E-05 | 3.73714E-08 | 0 | 0.00044599 |
| 20200 | 6.55908E-05 | 3.71961E-08 | 0 | 0.000443602 |
| 20400 | 6.51849E-05 | 4.44932E-08 | 0 | 0.000478616 |
| 20600 | 6.36455E-05 | 4.58317E-08 | 0 | 0.000483249 |
| 20800 | 6.48545E-05 | 3.84469E-08 | 0 | 0.000449169 |
| 21000 | 6.42654E-05 | 3.71656E-08 | 0 | 0.000442122 |

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| 21200 | 6.25805E-05 | 3.84831E-08 | 0 | 0.000447076 |
| 21400 | 5.76901E-05 | 3.15993E-08 | 0 | 0.000406103 |
| 21600 | 5.71045E-05 | 3.40143E-08 | 0 | 0.000418587 |
| 21800 | 5.18682E-05 | 2.60775E-08 | 0 | 0.00036838 |
| 22000 | 4.83082E-05 | 2.4484E-08 | 0 | 0.000354996 |
| 22200 | 5.38955E-05 | 3.57767E-08 | 0 | 0.000424624 |
| 22400 | 5.01558E-05 | 3.03827E-08 | 0 | 0.000391796 |
| 22600 | 4.68938E-05 | 2.38288E-08 | 0 | 0.000349451 |
| 22800 | 4.9863E-05 | 2.88529E-08 | 0 | 0.000382791 |
| 23000 | 5.18134E-05 | 3.51454E-08 | 0 | 0.000419256 |
| 23200 | 5.40736E-05 | 4.26207E-08 | 0 | 0.000458711 |
| 23400 | 5.22003E-05 | 4.64621E-08 | 0 | 0.00047468 |
| 23600 | 5.02295E-05 | 3.82262E-08 | 0 | 0.000433439 |
| 23800 | 4.60651E-05 | 2.88096E-08 | 0 | 0.000378744 |
| 24000 | 4.33305E-05 | 2.5243E-08 | 0 | 0.000354736 |
| 24200 | 4.34041E-05 | 2.78527E-08 | 0 | 0.000370511 |
| 24400 | 4.40771E-05 | 2.69962E-08 | 0 | 0.000366115 |
| 24600 | 4.76781E-05 | 3.35911E-08 | 0 | 0.000406905 |
| 24800 | 4.9089E-05 | 3.58111E-08 | 0 | 0.000419996 |
| 25000 | 5.27534E-05 | 4.27027E-08 | 0 | 0.00045778 |
| 25200 | 4.97603E-05 | 3.87857E-08 | 0 | 0.000435764 |
| 25400 | 4.07705E-05 | 2.32459E-08 | 0 | 0.000339604 |
| 25600 | 3.98202E-05 | 2.5981E-08 | 0 | 0.000355745 |
| 25800 | 3.74589E-05 | 2.21106E-08 | 0 | 0.000328904 |
| 26000 | 3.75068E-05 | 2.16416E-08 | 0 | 0.000325844 |
| 26200 | 3.99572E-05 | 2.61446E-08 | 0 | 0.000356875 |
| 26400 | 4.30445E-05 | 3.42149E-08 | 0 | 0.000405591 |
| 26600 | 3.81455E-05 | 2.59884E-08 | 0 | 0.000354116 |
| 26800 | 4.11216E-05 | 3.19721E-08 | 0 | 0.000391584 |
| 27000 | 4.20531E-05 | 4.01901E-08 | 0 | 0.000434983 |
| 27200 | 3.99503E-05 | 3.57351E-08 | 0 | 0.000410463 |
| 27400 | 4.03065E-05 | 3.21941E-08 | 0 | 0.000391984 |
| 27600 | 4.09229E-05 | 3.23576E-08 | 0 | 0.000393492 |
| 27800 | 3.69281E-05 | 2.53811E-08 | 0 | 0.000349185 |
| 28000 | 3.39384E-05 | 1.96974E-08 | 0 | 0.000309019 |
| 28200 | 3.63031E-05 | 2.45658E-08 | 0 | 0.000343504 |
| 28400 | 3.67894E-05 | 2.71152E-08 | 0 | 0.000359536 |
| 28600 | 3.47038E-05 | 2.20965E-08 | 0 | 0.000326056 |
| 28800 | 3.2399E-05 | 1.85847E-08 | 0 | 0.000299598 |
| 29000 | 3.30702E-05 | 2.02351E-08 | 0 | 0.000311881 |
| 29200 | 3.4589E-05 | 2.33643E-08 | 0 | 0.000334182 |
| 29400 | 3.24195E-05 | 1.97026E-08 | 0 | 0.000307537 |
| 29600 | 2.87723E-05 | 1.42579E-08 | 0 | 0.000262809 |
| 29800 | 2.93973E-05 | 1.51955E-08 | 0 | 0.000271006 |
| 30000 | 2.92637E-05 | 1.50622E-08 | 0 | 0.000269811 |
| 30200 | 2.89572E-05 | 1.57286E-08 | 0 | 0.000274768 |
| 30400 | 2.78185E-05 | 1.51389E-08 | 0 | 0.000268978 |
| 30600 | 2.86336E-05 | 1.68993E-08 | 0 | 0.000283429 |
| 30800 | 2.8351E-05 | 1.51211E-08 | 0 | 0.000269368 |
| 31000 | 2.92637E-05 | 1.66011E-08 | 0 | 0.000281801 |
| 31200 | 3.00103E-05 | 2.05342E-08 | 0 | 0.000310873 |
| 31400 | 2.60993E-05 | 1.29831E-08 | 0 | 0.000249428 |
| 31600 | 2.54726E-05 | 1.33242E-08 | 0 | 0.000251717 |
| 31800 | 2.56027E-05 | 1.30176E-08 | 0 | 0.000249228 |
| 32000 | 2.40582E-05 | 1.20877E-08 | 0 | 0.000239548 |
| 32200 | 2.21267E-05 | 1.14009E-08 | 0 | 0.000231406 |

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| 32400 | 2.09144E-05 | 9.0964E-09 | 0 | 0.00020785 |
| 32600 | 1.93733E-05 | 7.92173E-09 | 0 | 0.000193821 |
| 32800 | 1.86866E-05 | 7.01175E-09 | 0 | 0.00018281 |
| 33000 | 1.90548E-05 | 7.58825E-09 | 0 | 0.000189792 |
| 33200 | 1.75702E-05 | 6.10514E-09 | 0 | 0.000170716 |
| 33400 | 1.59726E-05 | 5.0995E-09 | 0 | 0.000155938 |
| 33600 | 1.50068E-05 | 4.93514E-09 | 0 | 0.000152698 |
| 33800 | 1.42997E-05 | 4.76594E-09 | 0 | 0.00014961 |
| 34000 | 1.46216E-05 | 5.33376E-09 | 0 | 0.000157766 |
| 34200 | 1.3738E-05 | 4.1181E-09 | 0 | 0.000139516 |
| 34400 | 1.28322E-05 | 3.73158E-09 | 0 | 0.000132562 |
| 34600 | 1.23202E-05 | 3.4736E-09 | 0 | 0.000127837 |
| 34800 | 1.23219E-05 | 3.4669E-09 | 0 | 0.000127727 |
| 35000 | 1.2214E-05 | 3.40654E-09 | 0 | 0.000126611 |
| 35200 | 1.22654E-05 | 3.47907E-09 | 0 | 0.000127873 |
| 35400 | 1.16318E-05 | 3.08534E-09 | 0 | 0.000120502 |
| 35600 | 1.11301E-05 | 2.67008E-09 | 0 | 0.000112409 |
| 35800 | 1.24264E-05 | 3.76545E-09 | 0 | 0.000132698 |
| 36000 | 1.31832E-05 | 4.36224E-09 | 0 | 0.000142636 |
| 36200 | 1.32551E-05 | 4.88778E-09 | 0 | 0.000150284 |
| 36400 | 1.15702E-05 | 2.95043E-09 | 0 | 0.000118033 |
| 36600 | 1.00394E-05 | 2.21129E-09 | 0 | 0.000102207 |
| 36800 | 9.35445E-06 | 2.0113E-09 | 0 | 9.72557E-05 |
| 37000 | 9.26199E-06 | 1.94505E-09 | 0 | 9.57033E-05 |
| 37200 | 9.44349E-06 | 1.99517E-09 | 0 | 9.69915E-05 |
| 37400 | 9.05993E-06 | 1.93766E-09 | 0 | 9.53368E-05 |
| 37600 | 8.97432E-06 | 1.92722E-09 | 0 | 9.50186E-05 |
| 37800 | 9.23801E-06 | 2.17123E-09 | 0 | 0.000100567 |
| 38000 | 9.7363E-06 | 2.4746E-09 | 0 | 0.000107237 |
| 38200 | 9.31164E-06 | 2.33572E-09 | 0 | 0.000104037 |
| 38400 | 9.87329E-06 | 2.87362E-09 | 0 | 0.000114941 |
| 38600 | 9.72432E-06 | 2.86436E-09 | 0 | 0.000114623 |
| 38800 | 8.33904E-06 | 1.92334E-09 | 0 | 9.42966E-05 |
| 39000 | 8.20034E-06 | 1.8809E-09 | 0 | 9.32043E-05 |
| 39200 | 8.46404E-06 | 2.33143E-09 | 0 | 0.000103102 |
| 39400 | 7.63527E-06 | 1.75495E-09 | 0 | 8.97439E-05 |
| 39600 | 7.87329E-06 | 1.83538E-09 | 0 | 9.18422E-05 |
| 39800 | 7.61815E-06 | 1.72001E-09 | 0 | 8.89053E-05 |
| 40000 | 7.89555E-06 | 1.79907E-09 | 0 | 9.10297E-05 |
| 40200 | 7.50856E-06 | 1.76629E-09 | 0 | 8.9882E-05 |
| 40400 | 7.17979E-06 | 1.7178E-09 | 0 | 8.84145E-05 |
| 40600 | 7.10788E-06 | 1.60597E-09 | 0 | 8.56539E-05 |
| 40800 | 6.74144E-06 | 1.43364E-09 | 0 | 8.09539E-05 |
| 41000 | 7.78596E-06 | 2.13493E-09 | 0 | 9.83483E-05 |
| 41200 | 8.40582E-06 | 2.99045E-09 | 0 | 0.000115588 |
| 41400 | 7.98288E-06 | 2.34105E-09 | 0 | 0.000102816 |
| 41600 | 7.78082E-06 | 2.21085E-09 | 0 | 9.99395E-05 |
| 41800 | 8.17295E-06 | 2.78953E-09 | 0 | 0.000111692 |
| 42000 | 8.04795E-06 | 2.99782E-09 | 0 | 0.000115363 |
| 42200 | 8.01884E-06 | 2.82744E-09 | 0 | 0.000112239 |
| 42400 | 8.11986E-06 | 2.87632E-09 | 0 | 0.000113237 |
| 42600 | 7.80993E-06 | 2.74459E-09 | 0 | 0.000110492 |
| 42800 | 7.54452E-06 | 2.63375E-09 | 0 | 0.000108132 |
| 43000 | 7.11301E-06 | 2.51288E-09 | 0 | 0.000105365 |
| 43200 | 6.65753E-06 | 2.35566E-09 | 0 | 0.000101786 |
| 43400 | 6.15925E-06 | 2.19079E-09 | 0 | 9.78988E-05 |

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|---|---|---|---|---|
| 43600 | 5.57363E-06 | 1.92142E-09 | 0 | 9.14882E-05 |
| 43800 | 5.2637E-06 | 1.67247E-09 | 0 | 8.54195E-05 |
| 44000 | 0.00000525 | 1.73636E-09 | 0 | 8.69226E-05 |
| 44200 | 5.08048E-06 | 1.70393E-09 | 0 | 8.59867E-05 |
| 44400 | 4.82705E-06 | 1.51423E-09 | 0 | 8.10969E-05 |
| 44600 | 4.91781E-06 | 1.48848E-09 | 0 | 8.05363E-05 |
| 44800 | 4.66438E-06 | 1.22531E-09 | 0 | 7.32731E-05 |
| 45000 | 4.07877E-06 | 9.43271E-10 | 0 | 6.42757E-05 |
| 45200 | 4.08733E-06 | 9.04106E-10 | 0 | 6.30213E-05 |
| 45400 | 4.37329E-06 | 1.02498E-09 | 0 | 6.71233E-05 |
| 45600 | 4.14041E-06 | 1.0049E-09 | 0 | 6.62728E-05 |
| 45800 | 3.99315E-06 | 9.38139E-10 | 0 | 6.40261E-05 |
| 46000 | 3.91781E-06 | 9.33002E-10 | 0 | 6.37862E-05 |
| 46200 | 4.00171E-06 | 1.10265E-09 | 0 | 6.90857E-05 |
| 46400 | 4.0411E-06 | 1.07786E-09 | 0 | 6.83895E-05 |
| 46600 | 3.75171E-06 | 9.1117E-10 | 0 | 6.29155E-05 |
| 46800 | 3.40582E-06 | 6.40107E-10 | 0 | 5.29945E-05 |
| 47000 | 3.27055E-06 | 6.13263E-10 | 0 | 5.18083E-05 |
| 47200 | 3.20205E-06 | 5.72757E-10 | 0 | 5.01094E-05 |
| 47400 | 3.30651E-06 | 6.33156E-10 | 0 | 5.26252E-05 |
| 47600 | 3.28767E-06 | 5.84985E-10 | 0 | 5.06931E-05 |
| 47800 | 3.2774E-06 | 5.94854E-10 | 0 | 5.10811E-05 |
| 48000 | 3.21747E-06 | 5.78042E-10 | 0 | 5.03408E-05 |
| 48200 | 3.03082E-06 | 5.02463E-10 | 0 | 4.69656E-05 |
| 48400 | 2.61986E-06 | 3.76106E-10 | 0 | 4.0631E-05 |
| 48600 | 2.38185E-06 | 3.16164E-10 | 0 | 3.72326E-05 |
| 48800 | 2.50514E-06 | 3.52482E-10 | 0 | 3.93032E-05 |
| 49000 | 2.66267E-06 | 4.558E-10 | 0 | 4.45077E-05 |
| 49200 | 2.47089E-06 | 3.58845E-10 | 0 | 3.95996E-05 |
| 49400 | 2.03767E-06 | 2.45476E-10 | 0 | 3.27463E-05 |
| 49600 | 1.94692E-06 | 2.27645E-10 | 0 | 3.15192E-05 |
| 49800 | 1.8339E-06 | 2.01517E-10 | 0 | 2.96574E-05 |
| 50000 | 1.81678E-06 | 1.93988E-10 | 0 | 2.91156E-05 |

**Appendix J. Prediction of mean, variance and upper bound of total solute flux for strong-sorption solute with source location at lower layers**
**[UCCSN Data ID No.: 025XH.001]**

| TIME (Year) | MEAN (Kg/yr) | VARIANCE (Kg/yr) | Lower Bound (Kg/yr) | Upper Bound |
|---|---|---|---|---|
| 100000 | 0 | 0 | 0 | 0 |
| 200000 | 0 | 0 | 0 | 0 |
| 300000 | 4.85908E-07 | 2.025E-11 | 0 | 9.30595E-06 |
| 400000 | 1.01302E-06 | 3.6407E-11 | 0 | 1.28393E-05 |
| 500000 | 1.00231E-06 | 2.8505E-11 | 0 | 1.14668E-05 |
| 600000 | 8.70894E-07 | 1.826E-11 | 0 | 9.24633E-06 |
| 700000 | 1.48442E-06 | 3.5206E-11 | 0 | 1.31141E-05 |
| 800000 | 1.30673E-06 | 2.1676E-11 | 0 | 1.0432E-05 |
| 900000 | 1.17278E-06 | 1.8785E-11 | 0 | 9.66786E-06 |
| 1000000 | 1.03924E-06 | 1.2345E-11 | 0 | 7.92584E-06 |
| 1100000 | 1.14884E-06 | 1.4939E-11 | 0 | 8.72446E-06 |
| 1200000 | 1.21802E-06 | 1.494E-11 | 0 | 8.79384E-06 |
| 1300000 | 1.24332E-06 | 1.3747E-11 | 0 | 8.51043E-06 |
| 1400000 | 1.16373E-06 | 1.0105E-11 | 0 | 7.39433E-06 |
| 1500000 | 1.30193E-06 | 1.3388E-11 | 0 | 8.47339E-06 |
| 1600000 | 1.30624E-06 | 1.3278E-11 | 0 | 8.4484E-06 |
| 1700000 | 1.24911E-06 | 1.0657E-11 | 0 | 7.64756E-06 |
| 1800000 | 1.23452E-06 | 9.488E-12 | 0 | 7.27197E-06 |
| 1900000 | 1.17915E-06 | 7.313E-12 | 0 | 6.47958E-06 |
| 2000000 | 1.22775E-06 | 8.553E-12 | 0 | 6.96002E-06 |
| 2100000 | 1.15518E-06 | 7.374E-12 | 0 | 6.4775E-06 |
| 2200000 | 1.16478E-06 | 7.297E-12 | 0 | 6.45915E-06 |
| 2300000 | 1.13837E-06 | 6.12E-12 | 0 | 5.98719E-06 |
| 2400000 | 1.16141E-06 | 6.869E-12 | 0 | 6.2985E-06 |
| 2500000 | 1.1859E-06 | 7.222E-12 | 0 | 6.45309E-06 |
| 2600000 | 1.05369E-06 | 4.739E-12 | 0 | 5.32024E-06 |
| 2700000 | 1.08778E-06 | 5.282E-12 | 0 | 5.59224E-06 |
| 2800000 | 1.10716E-06 | 6.232E-12 | 0 | 6.00015E-06 |
| 2900000 | 9.92908E-07 | 4.706E-12 | 0 | 5.24465E-06 |
| 3000000 | 9.50253E-07 | 4.357E-12 | 0 | 5.04132E-06 |
| 3100000 | 9.10168E-07 | 4.047E-12 | 0 | 4.85326E-06 |
| 3200000 | 8.97623E-07 | 3.773E-12 | 0 | 4.70477E-06 |
| 3300000 | 8.89949E-07 | 4.39E-12 | 0 | 4.99653E-06 |
| 3400000 | 9.59318E-07 | 4.45E-12 | 0 | 5.09413E-06 |
| 3500000 | 9.12979E-07 | 3.483E-12 | 0 | 4.57073E-06 |
| 3600000 | 9.29808E-07 | 3.785E-12 | 0 | 4.74281E-06 |
| 3700000 | 9.76336E-07 | 4.628E-12 | 0 | 5.1928E-06 |
| 3800000 | 8.73329E-07 | 3.499E-12 | 0 | 4.53966E-06 |
| 3900000 | 7.84771E-07 | 2.822E-12 | 0 | 4.07732E-06 |
| 4000000 | 7.59384E-07 | 2.633E-12 | 0 | 3.93948E-06 |
| 4100000 | 7.03425E-07 | 1.957E-12 | 0 | 3.44546E-06 |
| 4200000 | 6.89339E-07 | 2.019E-12 | 0 | 3.47435E-06 |
| 4300000 | 6.73606E-07 | 1.858E-12 | 0 | 3.34535E-06 |
| 4400000 | 6.38188E-07 | 1.627E-12 | 0 | 3.13807E-06 |
| 4500000 | 6.60743E-07 | 1.902E-12 | 0 | 3.36413E-06 |
| 4600000 | 7.07356E-07 | 2.282E-12 | 0 | 3.66812E-06 |
| 4700000 | 7.19065E-07 | 2.507E-12 | 0 | 3.8224E-06 |
| 4800000 | 7.34291E-07 | 2.448E-12 | 0 | 3.80102E-06 |
| 4900000 | 6.73921E-07 | 2.321E-12 | 0 | 3.65968E-06 |

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|---|---|---|---|---|
| 5000000 | 6.7164E-07 | 2.145E-12 | 0 | 3.54219E-06 |
| 5100000 | 6.62637E-07 | 2.184E-12 | 0 | 3.55912E-06 |
| 5200000 | 6.07318E-07 | 1.815E-12 | 0 | 3.24819E-06 |
| 5300000 | 5.66753E-07 | 1.627E-12 | 0 | 3.06714E-06 |
| 5400000 | 5.51438E-07 | 1.479E-12 | 0 | 2.93473E-06 |
| 5500000 | 5.37997E-07 | 1.417E-12 | 0 | 2.8715E-06 |
| 5600000 | 5.22479E-07 | 1.401E-12 | 0 | 2.84219E-06 |
| 5700000 | 4.94188E-07 | 1.304E-12 | 0 | 2.7322E-06 |
| 5800000 | 4.55428E-07 | 1.037E-12 | 0 | 2.45098E-06 |
| 5900000 | 4.58062E-07 | 1.095E-12 | 0 | 2.50914E-06 |
| 6000000 | 4.60202E-07 | 1.285E-12 | 0 | 2.68179E-06 |
| 6100000 | 4.65798E-07 | 1.372E-12 | 0 | 2.76182E-06 |
| 6200000 | 4.93168E-07 | 1.524E-12 | 0 | 2.9127E-06 |
| 6300000 | 5.03682E-07 | 1.627E-12 | 0 | 3.00388E-06 |
| 6400000 | 4.64788E-07 | 1.328E-12 | 0 | 2.72352E-06 |
| 6500000 | 4.30236E-07 | 1.131E-12 | 0 | 2.51506E-06 |
| 6600000 | 4.01092E-07 | 1.042E-12 | 0 | 2.40166E-06 |
| 6700000 | 3.76541E-07 | 9.26E-13 | 0 | 2.26239E-06 |
| 6800000 | 3.52716E-07 | 7.65E-13 | 0 | 2.06724E-06 |
| 6900000 | 3.38507E-07 | 6.96E-13 | 0 | 1.97382E-06 |
| 7000000 | 3.45034E-07 | 7.13E-13 | 0 | 1.99963E-06 |
| 7100000 | 3.38733E-07 | 7.39E-13 | 0 | 2.024E-06 |
| 7200000 | 3.34654E-07 | 7.32E-13 | 0 | 2.01117E-06 |
| 7300000 | 3.35596E-07 | 7.72E-13 | 0 | 2.05768E-06 |
| 7400000 | 3.28438E-07 | 7.77E-13 | 0 | 2.05585E-06 |
| 7500000 | 3.12442E-07 | 7.26E-13 | 0 | 1.98261E-06 |
| 7600000 | 2.92962E-07 | 6.45E-13 | 0 | 1.86728E-06 |
| 7700000 | 2.84288E-07 | 6.32E-13 | 0 | 1.84234E-06 |
| 7800000 | 2.75777E-07 | 6.21E-13 | 0 | 1.81998E-06 |
| 7900000 | 2.70318E-07 | 5.89E-13 | 0 | 1.77472E-06 |
| 8000000 | 2.54017E-07 | 5.48E-13 | 0 | 1.70549E-06 |
| 8100000 | 2.31027E-07 | 4.69E-13 | 0 | 1.57329E-06 |
| 8200000 | 2.10959E-07 | 3.58E-13 | 0 | 1.38377E-06 |
| 8300000 | 2.12818E-07 | 3.66E-13 | 0 | 1.39898E-06 |
| 8400000 | 2.1736E-07 | 4.09E-13 | 0 | 1.47148E-06 |
| 8500000 | 2.22493E-07 | 5.11E-13 | 0 | 1.62419E-06 |
| 8600000 | 2.03603E-07 | 4.47E-13 | 0 | 1.5144E-06 |
| 8700000 | 1.94747E-07 | 4.44E-13 | 0 | 1.50088E-06 |
| 8800000 | 1.79075E-07 | 3.04E-13 | 0 | 1.25911E-06 |
| 8900000 | 1.57421E-07 | 2.07E-13 | 0 | 1.04935E-06 |
| 9000000 | 1.47483E-07 | 1.87E-13 | 0 | 9.9612E-07 |
| 9100000 | 1.45216E-07 | 1.92E-13 | 0 | 1.00477E-06 |
| 9200000 | 1.44983E-07 | 2.61E-13 | 0 | 1.1471E-06 |
| 9300000 | 1.45205E-07 | 1.93E-13 | 0 | 1.00643E-06 |
| 9400000 | 1.44545E-07 | 1.84E-13 | 0 | 9.85538E-07 |
| 9500000 | 1.38353E-07 | 1.92E-13 | 0 | 9.96993E-07 |
| 9600000 | 1.25777E-07 | 1.51E-13 | 0 | 8.88496E-07 |
| 9700000 | 1.26068E-07 | 1.62E-13 | 0 | 9.15608E-07 |
| 9800000 | 1.08421E-07 | 1.21E-13 | 0 | 7.90885E-07 |
| 9900000 | 1.18168E-07 | 1.6E-13 | 0 | 9.02598E-07 |
| 10000000 | 1.14596E-07 | 1.62E-13 | 0 | 9.03796E-07 |
| 10100000 | 1.05291E-07 | 1.21E-13 | 0 | 7.85814E-07 |
| 10200000 | 1.12678E-07 | 1.49E-13 | 0 | 8.68878E-07 |
| 10300000 | 1.19175E-07 | 1.91E-13 | 0 | 9.74907E-07 |
| 10400000 | 1.20154E-07 | 2.19E-13 | 0 | 1.03812E-06 |
| 10500000 | 1.16017E-07 | 2.15E-13 | 0 | 1.02564E-06 |

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|---|---|---|---|---|
| 10600000 | 1.06935E-07 | 1.61E-13 | 0 | 8.92791E-07 |
| 10700000 | 9.81438E-08 | 1.27E-13 | 0 | 7.96645E-07 |
| 10800000 | 9.82158E-08 | 1.42E-13 | 0 | 8.37623E-07 |
| 10900000 | 9.83219E-08 | 1.33E-13 | 0 | 8.12463E-07 |
| 11000000 | 1.07753E-07 | 1.73E-13 | 0 | 9.23097E-07 |
| 11100000 | 1.1013E-07 | 1.75E-13 | 0 | 9.29292E-07 |
| 11200000 | 1.19017E-07 | 2.28E-13 | 0 | 1.05443E-06 |
| 11300000 | 1.03863E-07 | 1.61E-13 | 0 | 8.89476E-07 |
| 11400000 | 8.71952E-08 | 1.15E-13 | 0 | 7.51076E-07 |
| 11500000 | 8.60068E-08 | 1.2E-13 | 0 | 7.64699E-07 |
| 11600000 | 8.38493E-08 | 1.08E-13 | 0 | 7.27134E-07 |
| 11700000 | 8.8274E-08 | 1.28E-13 | 0 | 7.88384E-07 |
| 11800000 | 9.56781E-08 | 1.69E-13 | 0 | 9.00462E-07 |
| 11900000 | 8.5613E-08 | 1.32E-13 | 0 | 7.97288E-07 |
| 12000000 | 9.4661E-08 | 1.8E-13 | 0 | 9.26275E-07 |
| 12100000 | 9.21199E-08 | 1.98E-13 | 0 | 9.64587E-07 |
| 12200000 | 8.99315E-08 | 1.7E-13 | 0 | 8.97676E-07 |
| 12300000 | 9.0976E-08 | 1.55E-13 | 0 | 8.61693E-07 |
| 12400000 | 8.53699E-08 | 1.41E-13 | 0 | 8.22318E-07 |
| 12500000 | 7.53151E-08 | 9.5E-14 | 0 | 6.78972E-07 |
| 12600000 | 8.29247E-08 | 1.31E-13 | 0 | 7.91129E-07 |
| 12700000 | 8.24692E-08 | 1.35E-13 | 0 | 8.03171E-07 |
| 12800000 | 7.51507E-08 | 1E-13 | 0 | 6.95434E-07 |
| 12900000 | 7.30925E-08 | 9.5E-14 | 0 | 6.77931E-07 |
| 13000000 | 0.000000077 | 1.11E-13 | 0 | 7.29304E-07 |
| 13100000 | 7.48151E-08 | 1.09E-13 | 0 | 7.20744E-07 |
| 13200000 | 6.58356E-08 | 7.4E-14 | 0 | 5.98219E-07 |
| 13300000 | 6.64384E-08 | 7.7E-14 | 0 | 6.10337E-07 |
| 13400000 | 6.59349E-08 | 7.7E-14 | 0 | 6.08403E-07 |
| 13500000 | 6.45959E-08 | 7.8E-14 | 0 | 6.13292E-07 |
| 13600000 | 6.22945E-08 | 7.7E-14 | 0 | 6.05233E-07 |
| 13700000 | 6.51918E-08 | 8.6E-14 | 0 | 6.40967E-07 |
| 13800000 | 6.44795E-08 | 7.8E-14 | 0 | 6.125E-07 |
| 13900000 | 6.81541E-08 | 1.03E-13 | 0 | 6.97652E-07 |
| 14000000 | 5.91062E-08 | 6.6E-14 | 0 | 5.60993E-07 |
| 14100000 | 5.75377E-08 | 6.8E-14 | 0 | 5.6745E-07 |
| 14200000 | 5.70685E-08 | 6.5E-14 | 0 | 5.55639E-07 |
| 14300000 | 5.32842E-08 | 6.1E-14 | 0 | 5.37152E-07 |
| 14400000 | 4.86712E-08 | 5.4E-14 | 0 | 5.04746E-07 |
| 14500000 | 4.61781E-08 | 4.4E-14 | 0 | 4.57268E-07 |
| 14600000 | 4.21952E-08 | 3.7E-14 | 0 | 4.17767E-07 |
| 14700000 | 4.27226E-08 | 3.8E-14 | 0 | 4.24661E-07 |
| 14800000 | 3.93596E-08 | 3.1E-14 | 0 | 3.82814E-07 |
| 14900000 | 0.000000037 | 2.8E-14 | 0 | 3.6213E-07 |
| 15000000 | 3.34384E-08 | 2.4E-14 | 0 | 3.39863E-07 |
| 15100000 | 3.22911E-08 | 2.4E-14 | 0 | 3.36755E-07 |
| 15200000 | 3.23973E-08 | 2.6E-14 | 0 | 3.49867E-07 |
| 15300000 | 2.99555E-08 | 1.9E-14 | 0 | 3.0012E-07 |
| 15400000 | 2.84075E-08 | 1.9E-14 | 0 | 2.98469E-07 |
| 15500000 | 2.81541E-08 | 1.8E-14 | 0 | 2.91219E-07 |
| 15600000 | 2.70205E-08 | 1.6E-14 | 0 | 2.78496E-07 |
| 15700000 | 2.75103E-08 | 1.8E-14 | 0 | 2.86896E-07 |
| 15800000 | 2.65068E-08 | 1.6E-14 | 0 | 2.74309E-07 |
| 15900000 | 2.50445E-08 | 1.4E-14 | 0 | 2.53559E-07 |
| 16000000 | 2.89623E-08 | 2E-14 | 0 | 3.09565E-07 |
| 16100000 | 2.94349E-08 | 2.3E-14 | 0 | 3.2595E-07 |

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|---|---|---|---|---|
| 16200000 | 2.84966E-08 | 2.1E-14 | 0 | 3.11575E-07 |
| 16300000 | 2.35137E-08 | 1.2E-14 | 0 | 2.36652E-07 |
| 16400000 | 2.13664E-08 | 1E-14 | 0 | 2.21474E-07 |
| 16500000 | 2.0637E-08 | 1E-14 | 0 | 2.13371E-07 |
| 16600000 | 2.12979E-08 | 1E-14 | 0 | 2.19315E-07 |
| 16700000 | 2.01301E-08 | 1E-14 | 0 | 2.1251E-07 |
| 16800000 | 1.98801E-08 | 9E-15 | 0 | 2.09714E-07 |
| 16900000 | 2.15308E-08 | 1.2E-14 | 0 | 2.3773E-07 |
| 17000000 | 2.14144E-08 | 1.2E-14 | 0 | 2.35542E-07 |
| 17100000 | 2.13596E-08 | 1.2E-14 | 0 | 2.40089E-07 |
| 17200000 | 2.24247E-08 | 1.6E-14 | 0 | 2.69968E-07 |
| 17300000 | 1.90582E-08 | 1E-14 | 0 | 2.14372E-07 |
| 17400000 | 1.83048E-08 | 9E-15 | 0 | 2.07694E-07 |
| 17500000 | 1.89589E-08 | 1.2E-14 | 0 | 2.32128E-07 |
| 17600000 | 1.73425E-08 | 9E-15 | 0 | 2.01647E-07 |
| 17700000 | 1.72842E-08 | 9E-15 | 0 | 2.04147E-07 |
| 17800000 | 1.71062E-08 | 9E-15 | 0 | 1.98107E-07 |
| 17900000 | 1.7637E-08 | 9E-15 | 0 | 2.03356E-07 |
| 18000000 | 1.66233E-08 | 9E-15 | 0 | 2.04351E-07 |
| 18100000 | 1.58767E-08 | 8E-15 | 0 | 1.91985E-07 |
| 18200000 | 1.53973E-08 | 7E-15 | 0 | 1.85138E-07 |
| 18300000 | 1.77911E-08 | 1.2E-14 | 0 | 2.28925E-07 |
| 18400000 | 1.8387E-08 | 1.4E-14 | 0 | 2.48394E-07 |
| 18500000 | 1.78288E-08 | 1.1E-14 | 0 | 2.23186E-07 |
| 18600000 | 1.76952E-08 | 1.2E-14 | 0 | 2.34679E-07 |
| 18700000 | 1.79966E-08 | 1.4E-14 | 0 | 2.52158E-07 |
| 18800000 | 1.81918E-08 | 1.5E-14 | 0 | 2.5908E-07 |
| 18900000 | 1.80548E-08 | 1.4E-14 | 0 | 2.49319E-07 |
| 19000000 | 1.77466E-08 | 1.5E-14 | 0 | 2.53871E-07 |
| 19100000 | 1.6976E-08 | 1.3E-14 | 0 | 2.42319E-07 |
| 19200000 | 1.59589E-08 | 1.3E-14 | 0 | 2.35917E-07 |
| 19300000 | 1.45616E-08 | 1.2E-14 | 0 | 2.24972E-07 |
| 19400000 | 1.33219E-08 | 1.1E-14 | 0 | 2.17346E-07 |
| 19500000 | 1.2339E-08 | 9E-15 | 0 | 2.01513E-07 |
| 19600000 | 1.15137E-08 | 8E-15 | 0 | 1.88136E-07 |
| 19700000 | 1.1613E-08 | 9E-15 | 0 | 1.94809E-07 |
| 19800000 | 1.09384E-08 | 8E-15 | 0 | 1.83983E-07 |
| 19900000 | 1.10479E-08 | 8E-15 | 0 | 1.82078E-07 |
| 20000000 | 1.01747E-08 | 6E-15 | 0 | 1.59627E-07 |
| 20100000 | 9.31849E-09 | 5E-15 | 0 | 1.4771E-07 |
| 20200000 | 9.57192E-09 | 5E-15 | 0 | 1.44089E-07 |
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| 20600000 | 8.98288E-09 | 5E-15 | 0 | 1.51883E-07 |
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| 21200000 | 7.34932E-09 | 3E-15 | 0 | 1.14786E-07 |
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| 21600000 | 5.73288E-09 | 2E-15 | 0 | 8.88245E-08 |
| 21700000 | 5.49658E-09 | 2E-15 | 0 | 8.58136E-08 |

| | | | | |
|---|---|---|---|---|
| 21800000 | 5.76712E-09 | 2E-15 | 0 | 9.2212E-08 |
| 21900000 | 5.92466E-09 | 2E-15 | 0 | 9.78405E-08 |
| 22000000 | 4.89384E-09 | 1E-15 | 0 | 7.87528E-08 |
| 22100000 | 4.41781E-09 | 1E-15 | 0 | 7.04321E-08 |
| 22200000 | 4.08562E-09 | 1E-15 | 0 | 6.71387E-08 |
| 22300000 | 4.13356E-09 | 1E-15 | 0 | 6.57539E-08 |
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| 22500000 | 3.46233E-09 | 1E-15 | 0 | 5.5745E-08 |
| 22600000 | 3.36301E-09 | 1E-15 | 0 | 5.57298E-08 |
| 22700000 | 3.2774E-09 | 1E-15 | 0 | 5.0833E-08 |
| 22800000 | 2.92466E-09 | 1E-15 | 0 | 4.77687E-08 |
| 22900000 | 2.71233E-09 | 0 | 0 | 4.51949E-08 |
| 23000000 | 2.93493E-09 | 1E-15 | 0 | 4.85956E-08 |
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| 23500000 | 2.5E-09 | 0 | 0 | 4.2845E-08 |
| 23600000 | 2.08219E-09 | 0 | 0 | 3.60318E-08 |
| 23700000 | 1.93493E-09 | 0 | 0 | 3.35637E-08 |
| 23800000 | 1.77397E-09 | 0 | 0 | 3.28809E-08 |
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| 24300000 | 1.68151E-09 | 0 | 0 | 3.27135E-08 |
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| 24600000 | 2.00685E-09 | 0 | 0 | 4.02969E-08 |
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| 24800000 | 1.90753E-09 | 0 | 0 | 4.01691E-08 |
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| 25000000 | 1.5137E-09 | 0 | 0 | 3.13293E-08 |