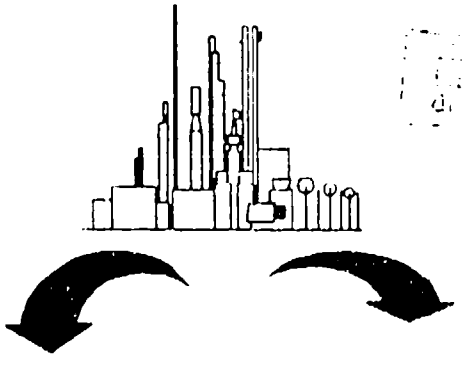
EVALUATING A HAZARDOUS WASTE SITE

Examining the Potential for Migration of Contaminants



Submitted by
Kimberly K. Stricklan
LT, CEC, USN

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by

Kimberly K. Stricklan

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Date _____

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All the strengths in this paper are the result of a group effort, credit for all the weaknesses lie with the author alone.

INTRODUCTION

In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was signed into law. It was later amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Under CERCLA (and modified by SARA), a National Priority List (NPL) of hazardous waste sites was established, along with specific guidelines for the clean-up of these sites.

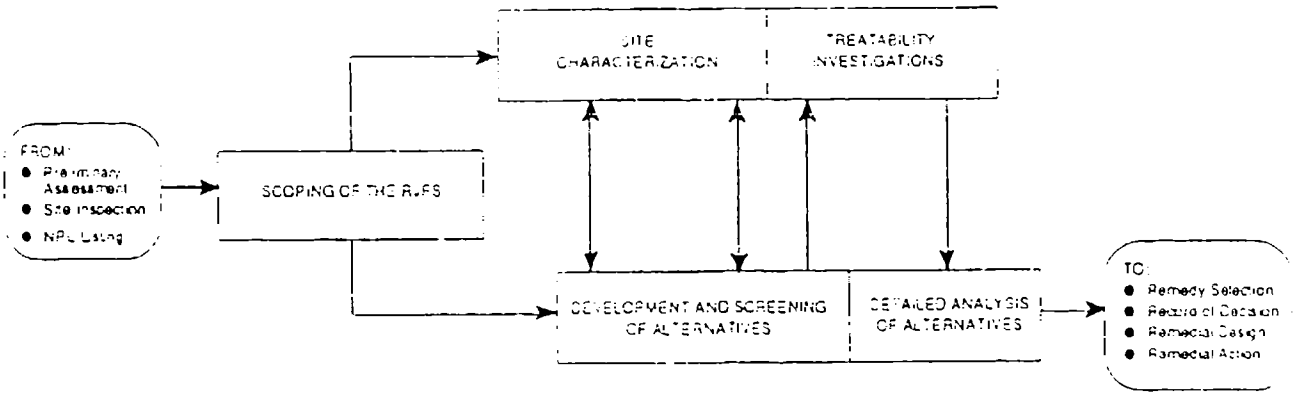


FIGURE 1 Remedial Investigation/Feasibility Study Process under CERCLA [5].

The clean-up process involves much more than just the actual site remediation work. As shown in figure 1, it includes everything from a preliminary assessment and initial inspection of the site, to remedial design and action. After scoping, shown as block two in the figure, the process is divided into two parts. The remedial investigation (RI) is conducted to characterize site conditions and conduct treatability

investigations. The other facet, the feasibility study (FS), is used to develop and screen possible remediation alternatives. As shown, the RI and FS are conducted concurrently. This is important because the data collected under the RI influences the development of remedial alternatives in the FS. Accordingly, the types of treatment being considered dictate what kind of data must be collected and analyzed in the RI [5]. The RI effort may cost hundreds of thousands of dollars and take 1 to 3 years to complete. This paper will focus solely on the site characterization evaluation requirements as part of the RI step leading to the clean-up process.

According to the Environmental Protection Agency (EPA) [5], there are four objectives in site characterization. They are conducting the field investigation, defining the nature and extent of contamination, identifying Federal/State contaminant and location specific ARAR's (Applicable or Relevant and Appropriate Requirements), and developing baseline risk assessments.

This study addresses the problem of determining the fate and behavior of contaminants at a hazardous waste site. The purpose was to determine the procedures required to assess the contaminants at a site and the factors that affect their transport. Limited available information about an existing hazardous waste site provided the necessary background to carry out the RI site characterization process. A brief qualitative assessment of the potential for environmental damage is also

provided.

Actual data on site characteristics and contaminants are needed to develop a practical evaluation of contaminant migration as part of an RI study. To satisfy this need, data from a hazardous waste site placed on the National Priority List in 1987 was used. This site is under the jurisdiction of the Department of Defense and specifically the U.S. Navy. It is located at the Naval Submarine Base in Bangor, Washington and is referred to as Site A. In this study, the following aspects of Site A were addressed:

1. The description and history, including physical features and a chronology of events leading to its placement on the NPL.
2. Information on the physical, chemical and biological behavior of the contaminants identified.
3. The surface water features of the site, including a surface runoff diversion facility.
4. The hydrogeological features, including data on five hydrogeologic zones located in the vicinity of Site A.
5. The distribution of contamination, including possible migration to neighboring communities.

Finally, a groundwater flow computer model was applied to Site A to show various scenarios of contaminant migration.

DESCRIPTION AND HISTORY OF SITE A

The Bangor Naval Submarine Base (SUBASE Bangor) is located in the state of Washington, on the Kitsap Peninsula. As shown in

figure 2, it is approximately 10 miles north of Bremerton and 7 miles west of Bainbridge Island. Situated on the shores of the Hood Canal, it encompasses approximately 7000 acres of land.

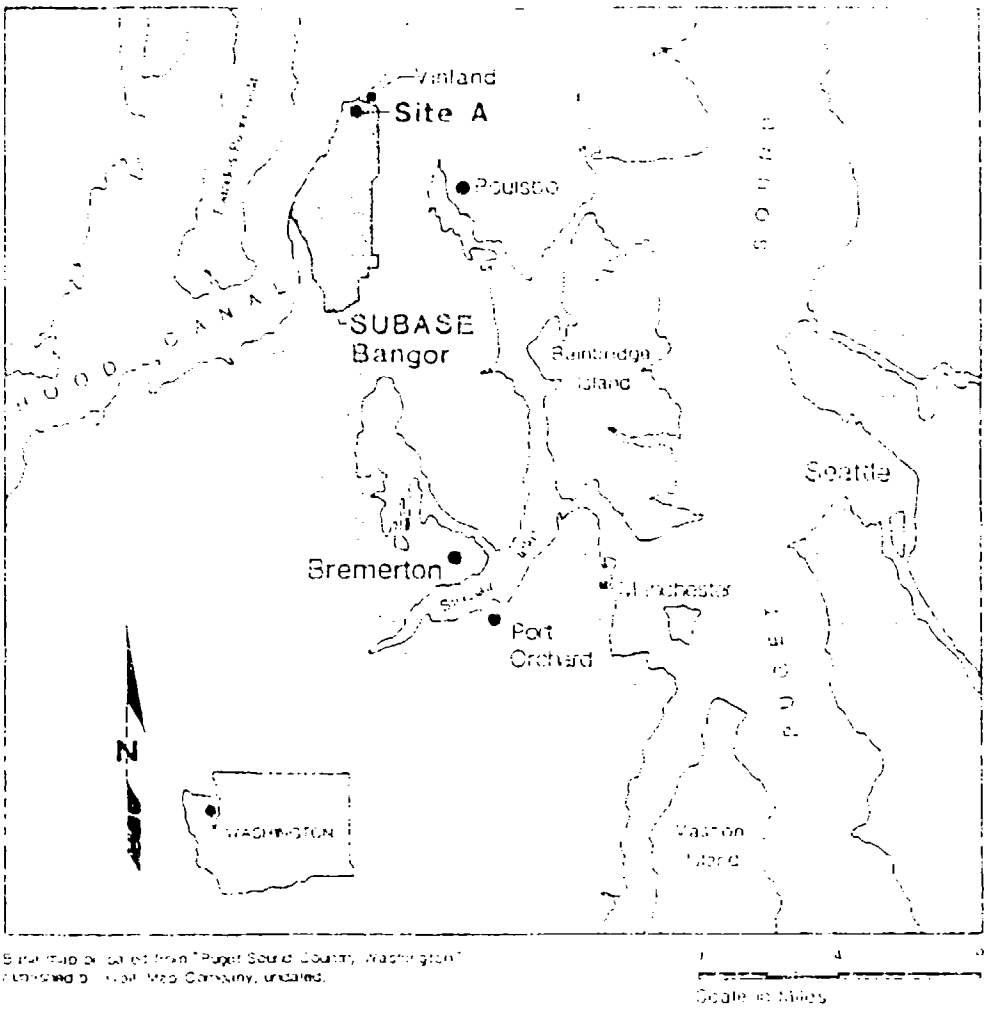


FIGURE 2 Map of Kitsap Peninsula area [2].

Site A is located in the Northwest portion of SUBASE, at the intersection of Tinosa and Pintado Roads, about 1800 feet southeast of Cattail Lake, and 2100 feet southeast of the Hood Canal (figure 3). The closest neighboring community, Vinland, is located just outside the northern boundary fence, roughly 2300

feet north of the site.

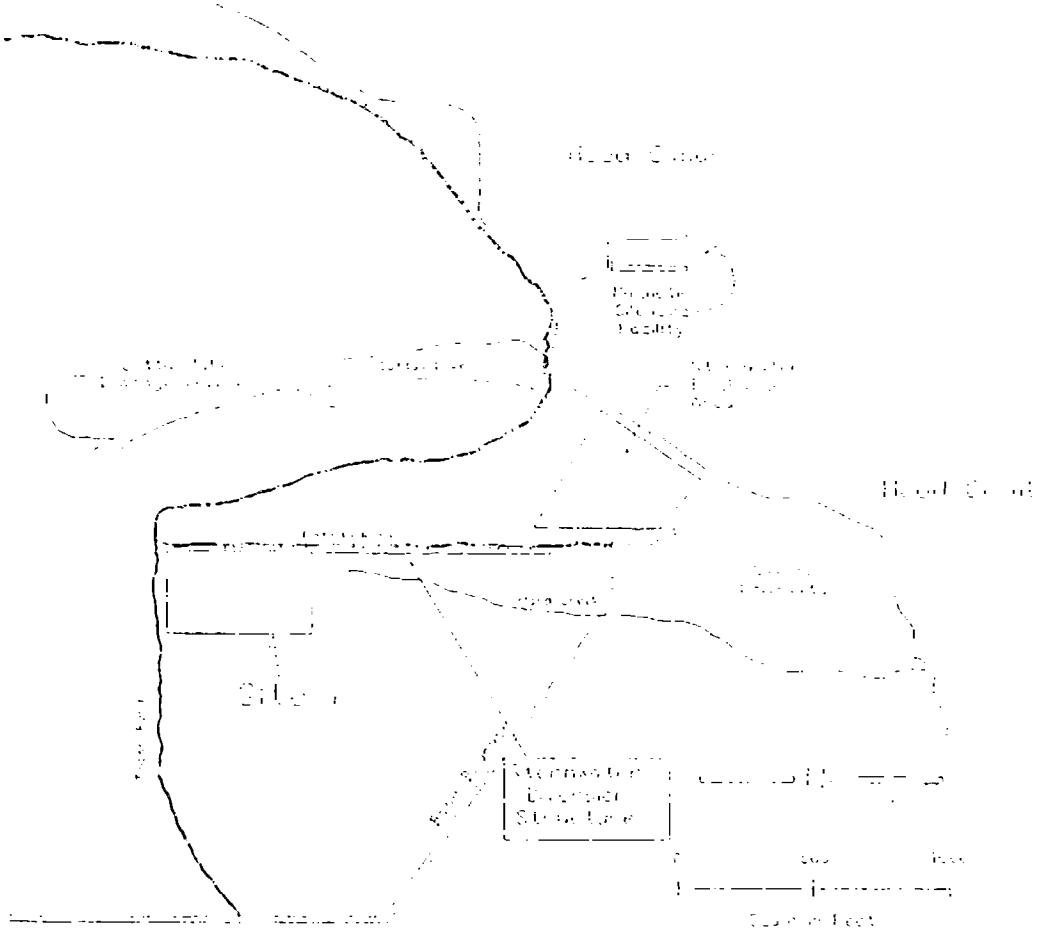


FIGURE 3 Map of Site A and vicinity [2].

Site A is slightly sloped downward toward Pintado Road and is an upland site, located at an elevation of 150 to 180 feet. The topographical features of the site and the surrounding area are shown in figure 4. It is between 10 and 12 acres in size [7].

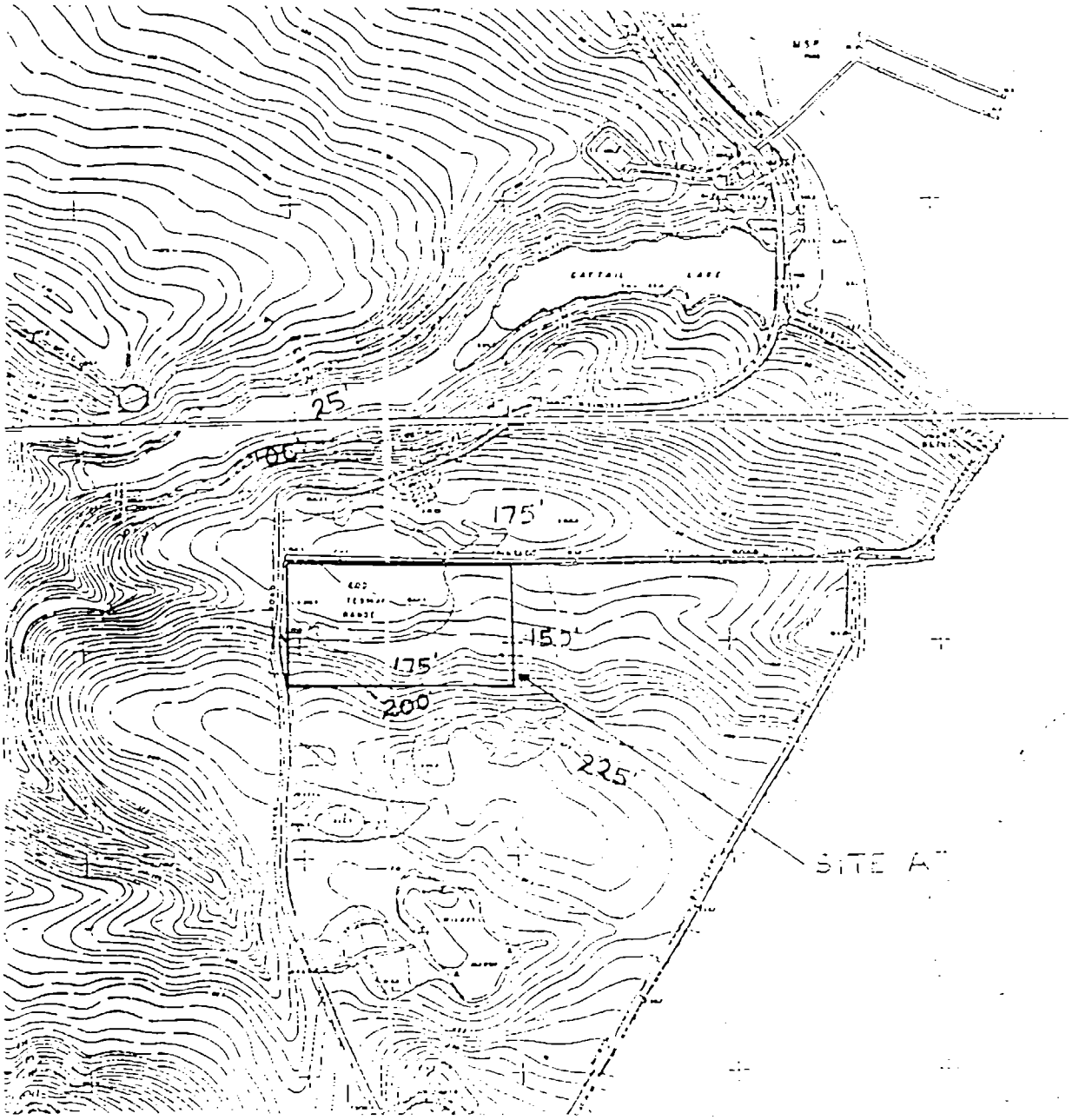


FIGURE 4 Topographic map of Site A and vicinity.

Photographs of Site A are shown in figures 5 and 6. They show the southern end of the site, on the edge of Tinosa Road. Although all vegetation was removed during earlier operations, much of the vegetation has grown back. However, there are still some areas, particularly around the burn mounds, that have little or no vegetation.

Site A is surrounded by a security fence, which was done as an interim measure to limit direct access to the site. Although it is located in a restricted part of SUBASE, access to Site A itself is limited to personnel with specific Occupational Safety and Health Administration (OSHA) training. This restriction also applied to the author, who was not permitted access to the site.

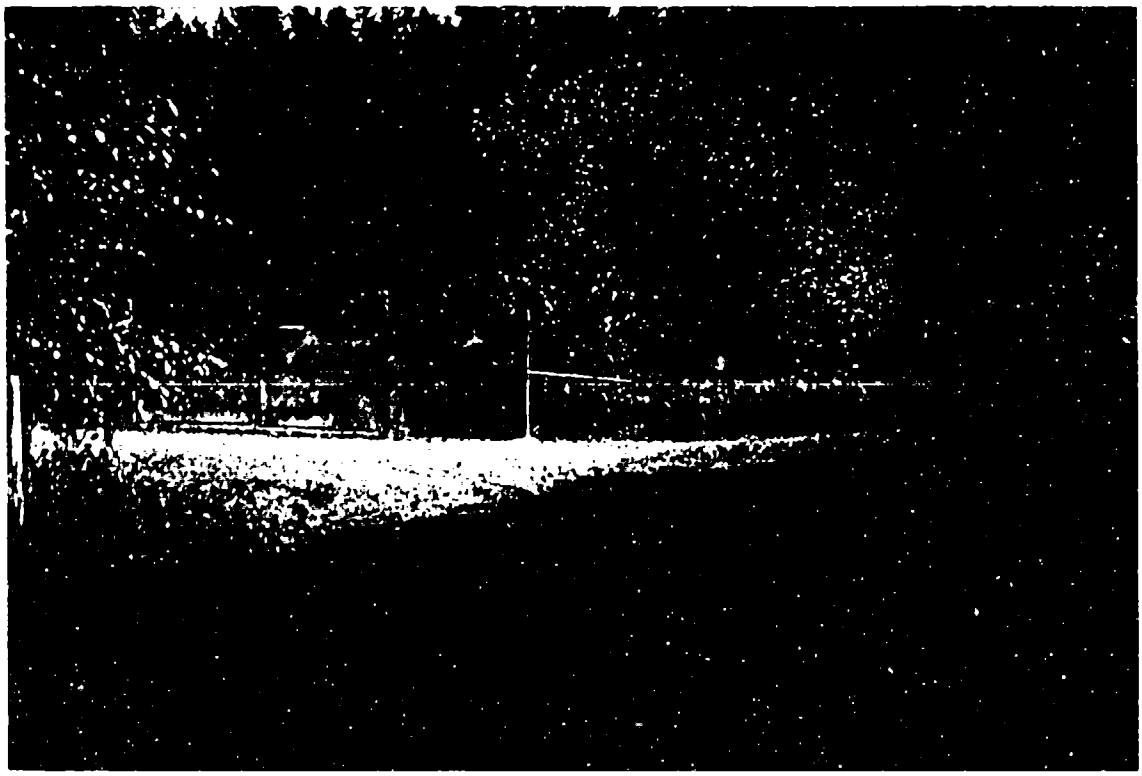


FIGURE 5 Photograph of Site A.

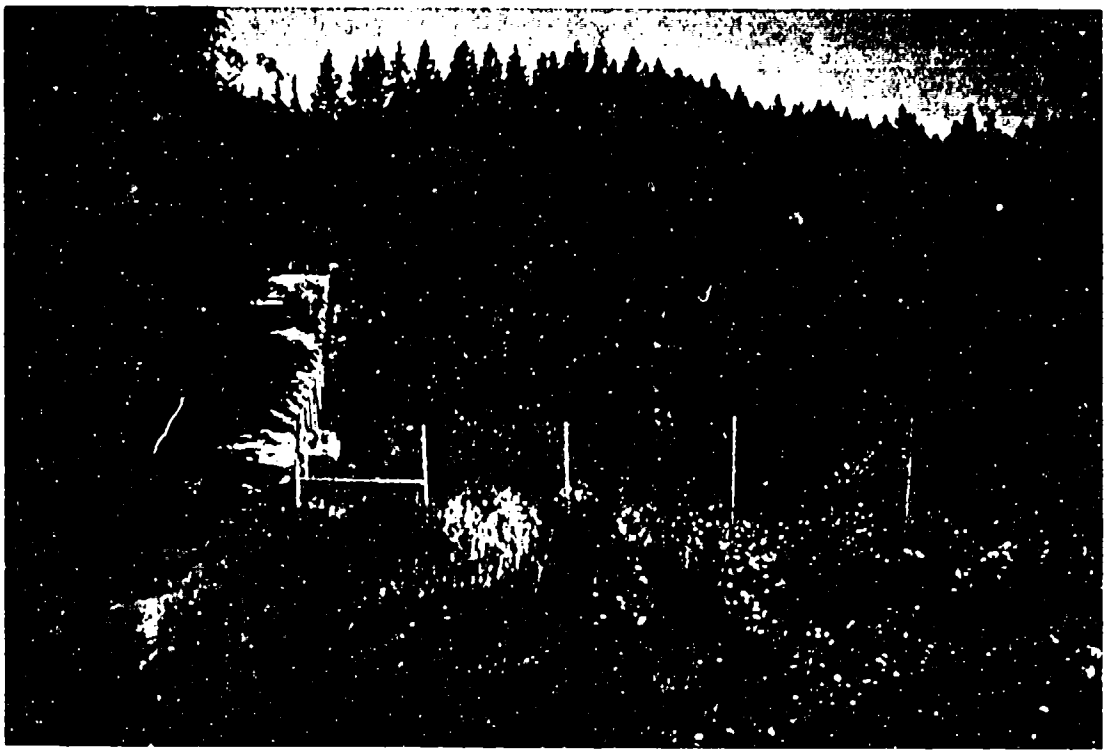


FIGURE 6 Photograph of Site A.

In 1944, a U.S. Naval Magazine Facility was established at Bangor and served as a transfer point. Fourteen years later, the disposal of ordnance was added to Bangor's mission. As a result, Site A was chosen as an ammunition burning and detonation site. It was used to burn TNT, flares, fuses, primers, smoke pots, smokeless powder, black powder, and other explosives [2]. Site A was also used as a storage site for barrels of "pink water", which is the condensate formed from steam cleaning operations involving TNT materials. It usually resulted from cleaning empty shell casings that previously contained TNT and other munitions compounds.

Disposal operations at Site A peaked between 1966 and 1970. However, in 1975 most of the activities conducted at Site A were

suspended due to concerns by the Navy about possible contamination as a result of U.S. Geological Survey reports. Two years later, the Navy began an Assessment and Control of Installation Pollutants (ACIP) program to evaluate their waste disposal sites, including Site A. For the next ten years, the Navy, under ACIP, collected several hundred soil and water samples from Site A and surrounding areas [2].

In 1987, the Navy ceased any further activity under ACIP due to the enactment of SARA by congress, and responded by phasing in the RI/FS program. In May of this year, the final RI/FS conducted on Site A was submitted to SUBASE Bangor. I decided not to obtain and read this report so that I could carry out an independent RI site evaluation, and relied on the Current Situation Report issued in 1988. A complete chronology of events leading up to the submission of the RI/FS is provided in appendix 1 [2].

Figure 7 summarizes the historical activities at Site A. The burn mounds, established in 1962 and later, were used for the disposal activities described above. The barrel storage areas were placed near the roads, on the edges of the site, to provide easy access for transport of the pink water to and from the site. The blast pit, used from 1970 to 1979, was shielded and used for TNT detonation. The incinerator in the lower right section of Site A was used for disposal of small arms and dangerous pyrotechnic items. Several other pits and trenches shown in the figure were used for burning or detonating various munitions [2].

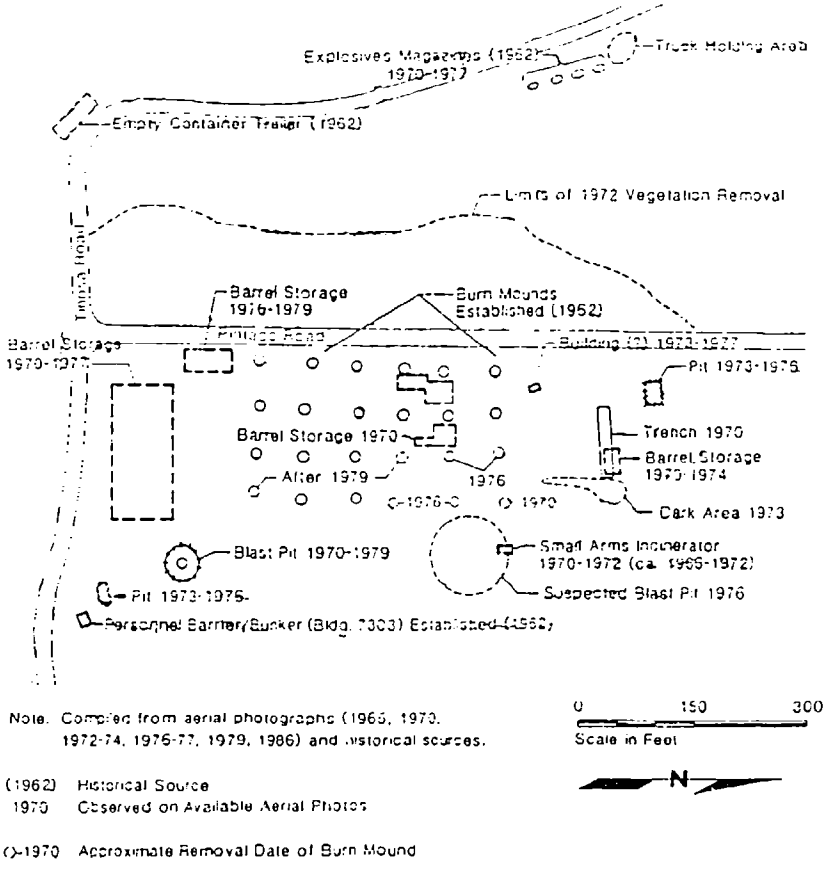


FIGURE 7 Map of Site A historical features [2].

Unfortunately, there is no accurate estimate of the amount of material that was disposed of at Site A. The amount was estimated from interviews and information in ordnance transfer documents. The resulting conservative estimate is that over two million pounds of munitions compounds were burned at Site A [7].

CONTAMINANT CHARACTERISTICS

There are 9 potential "contaminants of concern" at Site A. Although numerous compounds were tested for at the site, these were chosen because they were obvious compounds used at the site and were detected above background levels. They are listed in table 1. In addition, Nitrogen, Copper, Mercury, Silver, and

Heptachlor were found at elevated levels, but are not related to any activities conducted at Site A. Because of the ambiguity associated with these contaminants, and lack of available data, they will not be discussed in this paper.

TABLE 1

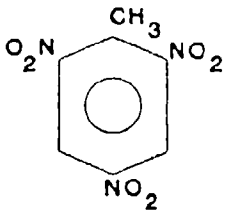
CONTAMINANTS OF CONCERN AT SITE A [2].

Name	Symbol (if applicable)
Zinc	Zn
2,4,6 Trinitrotoluene	TNT
2,4 Dinitrotoluene	2,4-DNT
2,6 Dinitrotoluene	2,6-DNT
1,3,5 Trinitrobenzene	1,3,5-TNB
Hexahydro-1,3,5 trinitro-1,3,5 triazine	RDX
Bis (2-ethylhexyl)phthalate	
Di-n-butylphthalate	
Di-n-octylphthalate	

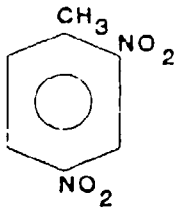
The chemical structures of the organic materials are shown in figure 8. In the following subsections, important physical, chemical, and biological characteristics (including known ARARs), the possible effect on humans after exposure, and the potential for biodegradation will be discussed for each contaminant.

Zinc

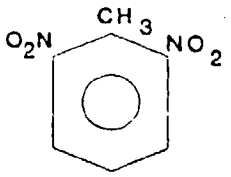
Zinc is an abundant, naturally occurring, metal in the environment. However, it was designated as a contaminant of concern because of the high concentrations found at Site A. Levels as high as 180 mg/kg were found in soil samples and the highest water concentration detected was 0.87 mg/l, well above background levels.



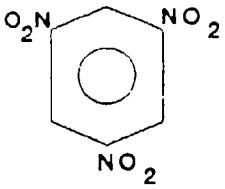
2,4,6-TNT



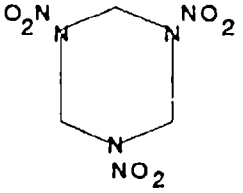
2,4-DNT



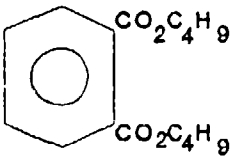
2,6-DNT

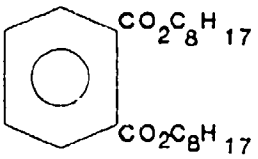


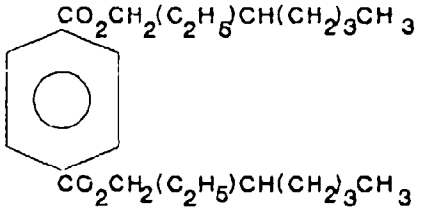
1,3,5-TNB



RDX







PHTHALATES

DI-N-BUTYL DI-N-OCTYL BIS(2-ETHYLHEXYL)

FIGURE 8 Chemical Structures of Contaminants of Concern [4,10].

Zinc, usually in solid form, has a strong tendency to sorb onto both organic and inorganic soil particles. However, some intermediate zinc complexes have been detected in water and are relatively non-reactive with solids. These forms tend to remain soluble for considerable periods of time. Because of its strong affinity for solids, zinc migrates primarily by particulate

transport associated with erosion [2].

Zinc is a required nutrient for human development, but in extremely high doses, can be detrimental. The drinking water standard for taste and odor control of zinc is 5 mg/L.

2,4,6-TNT

2,4,6 trinitrotoluene, or TNT, is a flammable solid which exists in commercial form as yellow monoclinic needles. Although used as an explosive, TNT is highly stable at room temperature. It is relatively non-volatile, and therefore not easily hydrolyzed. The solubility of TNT is 130 mg/L, and its tendency to sorb onto solids is moderate with a partition coefficient of between 10:1 and 20:1. This coefficient, used for all contaminants, called Kd, an empirical soil:water distribution coefficient. It represents the ratio of mass of compound per unit mass of soil to the mass of compound per unit mass of water. Therefore, the higher the ratio, the greater the tendency to sorb to solids, and the lower the migration potential of that compound in groundwater.

The effects of TNT on humans, found from occupational exposure, include toxic hepatitis, aplastic and hemolytic anemia, gastrointestinal disruptions, contact dermatitis, and cataracts. The effects on the blood system can include hemolysis of red cells and hemoglobin in the blood stream [2]. There is no data available about TNT carcinogenicity. As a final note, TNT is also known to be toxic to various forms of aquatic life, including certain species of green algae, oyster larvae, fathead

minnows, and bluegills [2].

The primary form of degradation in the natural environment is photolysis. In fact, the half-life in natural sunlight can be as low as three hours. Although TNT is susceptible to degradation under natural conditions, it can persist in the environment for long periods of time. Accordingly, biodegradation by bacteria or fungal species is slow. However, biodegradation could be accelerated if an alternate carbon source were available [2]. Since this is not the case at Site A, an outside carbon source would be required if this method of treatment was being considered.

TNT biodegradation by Phanerochaete chrysoporium, or white rot fungi has been studied by Fernando et al [3]. In this study, the initial concentrations of TNT were set to 10,000 mg/kg in soil and 100 mg/L in water. The results of the study, for both soil and water, are shown in table 2.

Overall approximately 85% of the initial TNT was degraded, with about 19% of the carbon appearing as carbon dioxide in 90 days. A low nitrogen to carbon ratio, in the range of 1 to 11 is an important requirement for TNT degradation by white rot fungi. This may be difficult to maintain under actual environmental conditions since nitrogen is released during the degradation process.

At Site A, the Total Kjeldahl Nitrogen (TKN) in the soil averages around 1500 mg/kg [7]. Therefore, the nitrogen to carbon ratio is much higher than that in the study. The high

TKN, in addition to the nitrogen released during TNT degradation, would further limit the success of using Phanerochaete Chrysosporium. Thus, while white rot fungi shows promise for TNT degradation, it might not be a good biological degradation choice for use at Site A.

TABLE 2

RESULTS OF BIODEGRADATION STUDY ON 2,4,6-TNT [3].

Soil Samples:

# of days	Amount of TNT degraded
30	49.2%
60	70.7%
90	87.7%

Water Samples:

# of days	Amount of TNT degraded
30	77.9%
60	85.1%
90	87.7%

2,4-DNT and 2,6-DNT

Both 2,4 DNT and 2,6 DNT exist as pale yellow crystals of various structure, and are major constituents of pink water and a product of TNT photodegradation [2,4].

Volatility of both materials is extremely low and their solubility is high. The solubilities of 2,4-DNT and 2,6 DNT are 270 mg/L and 180 mg/L. The sorption coefficient (Kd) for both isomers is low, with a soil to water ratio of only 2:1 to 4:1 for each substance [2].

Studies have shown that exposure to 2,4-DNT can cause neuromuscular effects, central nervous system and liver lesions, weight loss, anorexia, anemia, and testicular atrophy. Studies conducted on munitions plant workers in the 1950's showed that cyanosis, dizziness, sleepiness, headache, dyspnea, and brown urine were among the results of repeated exposure to DNT [2]. Health criteria does exist for 2,6-DNT as a potential carcinogen. The 2,4 isomer is a potential carcinogen as well, but the only existing standards are based on 2,6-DNT.

Both forms of DNT readily degrade in anaerobic environments, providing there is an external carbon source present. Degradation products include aromatic diamines, aminonitrotoluenes, and nitrosonitrotoluenes. As with TNT, the primary form of degradation in the natural environment is photolysis. The average half-life is between 9.5 and 11.5 days. One intermediate product is 2,4 dinitrobenzoic acid, with end-products of carbon dioxide, water, and nitric acid resulting [2].

1,3,5-TNB

1,3,5-TNB, a known constituent in TNT wastewaters, has a yellow crystalline structure in pure form. It is a high explosive with more shattering power and less sensitivity to impact than TNT, but is no longer widely used in munitions. Limited studies have shown that 1,3,5-TNB is mutagenic to microorganisms, but very little is known about the compound itself [2].

RDX

A major contaminant of concern at Site A is hexahydro-1,3,5 trinitro-1,3,5 triazine, or RDX. This substance is a white crystalline high explosive, which is a primary component used in C-4 plastic, as well as in the manufacture of other munitions.

Similar to TNT, RDX is relatively non-volatile. Water solubility ranges from 8 to 45 mg/L. Of all the contaminants of concern, RDX has the lowest Kd value, in the range of only 1:1 to 2:1. As a result, RDX has the greatest tendency to migrate through groundwater. This is one reason the groundwater concentrations of RDX at Site A and vicinity were detected while other contaminants were not [2].

RDX appears to be sorbed through the stomach, and by inhalation through the lungs. Following adsorption, it seems to quickly metabolize within the liver into products such as inorganic carbon or formic acid. However, RDX is considered toxic to laboratory animals. In recent studies, exposure to RDX caused several reactions including convulsions, hepatotoxicity, anemia, splenic and urogenital lesions, prostate gland inflammation, and a variety of biochemical changes. Although it has been tested for carcinogenicity, the results were inconclusive [2].

Photolysis is the primary form of degradation in the natural environment, with a half-life of 1 to 12 days. However, it should be noted that TNT tends to retard the degradation rate. The end products of photolysis include formaldehyde, nitrate, nitrite, and ammonia. Another form of degradation that has met

with some success is thermal decomposition. RDX has also been known to biodegrade in a nutrient rich, anaerobic environment. The end-products for this process include formaldehyde, methanol, and hydrazine [2].

Phthalates

Three such compounds, di-n-butylphthalate, di-n-octylphthalate, and bis(2-ethylhexyl)phthalate (BEHP) are included as contaminants of concern at Site A. Phthalates are colorless liquids used as plasticizers in the production of polyvinyl chloride (PVC).

Phthalates are also non-volatile, with a vapor pressure as low as 6.8 x 10^-8 mm Hg. Solubility is low, in the range of .4 to 4.5 mg/L. The phthalates have the highest soil partitioning coefficient with a Kd ranging from 100:1 to as high as 10,000:1. Therefore, these compounds tend to remain in the soil and should not migrate well through surface or groundwater. Exact soil concentrations showing this phenomena will be shown later. The primary mechanism for loss is through hydraulic export in surface and groundwater [2].

Phthalates are readily sorbed in the intestinal tract and the lungs. Elevated levels of phthalates in the blood stream have been documented after ingestion of food that has been in contact with flexible plastics. One of the greater concerns for human exposure to phthalates appears to be from PVC bags and tubing used when treating dialysis patients. Although BEHP is considered an animal carcinogen, in general, data is inconclusive

to support carcinogenicity to humans [2].

Unlike the other contaminants present at Site A, phthalates are resistent to photolysis. In pond environments, BEHP tends to remain in the sediment. Although BEHP is capable of degradation under aerobic conditions, it is an extremely slow process [2].

Table 3 summarizes contaminant physical characteristics that are related to compound transport phenomena.

TABLE 3

SUMMARY OF CONTAMINANT CHARACTERISTICS [7, 11]

CONTAMINANT	MOLECULAR WEIGHT (g/mol)	VAPOR PRESSURE (mm Hg)	HENRY'S CONSTANT (atm-m3/mol)	SOLUBILITY (mg/l)	SORPTION COEFFICIENT (koc)	OCTANAL: WATER (LOG Kow)	WATER MPAR (mg/l)
Zinc	65.4	0	0	0	?	N/A	5.0
TNT	227.2	4.6e-2	0.13	130	20:1	1.6	?
2,4 DNT	182.1	1.1e-4	0.51e-6	270	2:1 to 4:1	1.98	0.00011
2,6 DNT	182.1	2.5e-4	none	180	2:1 to 4:1	1.9	0.07
TNB	213.1	2.2e-4	none	300	?	1.18	?
RDX	222.3	2e-3	none	45	1:1 to 2:1	0.87	?
BEHP	391	6.5e-8	none	1.3	> 100:1	5.3	?
Di-n-butylphth.	278	1e-5	2.9e-7	13	> 100:1	5.6	?
Di-n-octylphth.	391	1e-5	none	0.25	> 100:1	?	0.0030

CHARACTERIZATION OF CONTAMINATION AT SITE A AND VICINITY

This section summarizes the results of sampling to determine the type and amount of contamination at Site A and how far the pollutants have migrated into surrounding areas. The sampling

program addressed possible contamination in soil, both surfacial and subsurface; water, both groundwater and surface runoff; vegetation; and shellfish. Each media will be addressed separately.

Soil

Between 1977 and 1986, numerous surface and core samples were taken from Site A and the surrounding vicinity. Figure 9 shows selected surface and subsurface sampling locations for the contaminant data, summarized in tables 4 and 5. As shown in the figure, the majority of the samples were taken directly from the site, or from an off-site area toward Cattail Lake Drainage. Surface sample areas are noted by the citation, A-SS**. Core samples are noted with the same designation as monitoring wells, or MW**. Sediment samples from Cattail Lake and the Hood Canal are represented by the designation SW** [2,7].

Tables 4 and 5 show the contaminant concentrations found at the various sampling locations, both at the site and the surrounding areas. Looking at Table 6 first, the highest concentrations are limited to the surface soil. In particular, there are elevated concentrations in samples taken from A-SS03 through A-SS05, which are located directly on the burn mounds. This is expected since the highest level of activity occurred at the burn mounds. TNT is the most concentrated contaminant, at levels ranging from 180 to 420 mg/kg in these areas. In the subsurface samples, most pollutants that were detected at all occurred at low levels and were found at MW-38. Since the

monitoring well was drilled directly on one of the burn mounds, these concentrations could be the result of the materials leaching into the subsurface soil from the burn mounds. In this table, the only contaminant found at high levels in both surface and subsurface samples was zinc. This could be due to possible elevated background levels of this material in the area.

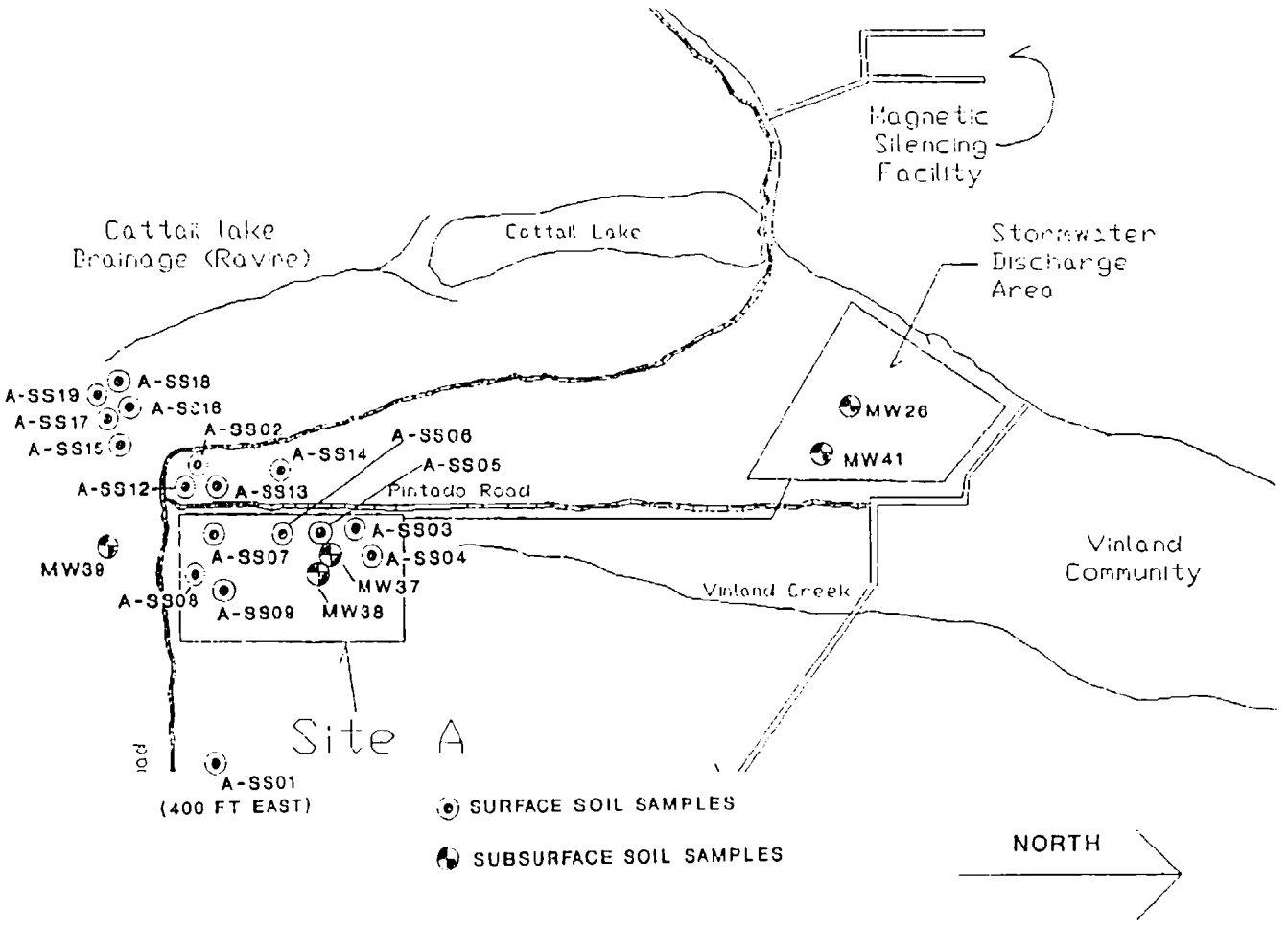


FIGURE 9 Soil Sample Location Plan [2].

TABLE 4

SOIL SAMPLE CONCENTRATIONS AT SITE A [7]
(All concentrations are in mg/kg)

Samples at Site A:

Surface samples:	A-SS03	A-SS04	A-SS05	A-SS06	A-SS07	A-SS08	A-SS09
Zinc	43	80	53	100	60	46	47
Di-n-butyl phthalate	0	0	0	0.15	0.22	0	0
Bis(2-eh)phthalate	0	0	0	0	0	0	0
Di-n-octyl phthalate	0	0	0	0	0	0	0
2,4,6-TNT	180	250	420	1.1	1.5	0.78	210
2,4-DNT	14	0.45	0.56	0.087	0.12	0.094	0.37
2,6-DNT	0.97	0.053	0.077	0.009	0.009	0.006	0.04
1,3,5-TNB	0	0.66	0.67	0.015	0.025	0.012	0.44
RDX	1.3	1.5	0	0.34	0.095	0.047	0.6

Subsurface samples:	MW-37	MW-37	MW-38	MW-38	MW-38	MW-38
depth:	(28 ft)	(76 ft)	(3 ft)	(13 ft)	(18 ft)	(23 ft)
Zinc	45	24	44	32	27	40
Di-n-butyl phthalate	0	0	0	0.066	0	0
Bis(2-eh)phthalate	0	0	0	0	0	0
Di-n-octyl phthalate	0	0	0	0	0	0
2,4,6-TNT	0	0	1	0.079	0.086	0.059
2,4-DNT	0	0	0.004	0.001	0.002	0.002
2,6-DNT	0	0	0.006	0	0	0
1,3,5-TNB	0.002	0.002	0.009	0	0.002	0.003
RDX	0.092	0.048	0.074	0	0.047	0.084

Table 5 shows the concentrations in samples taken from areas adjacent to Site A. In these areas, contamination also appears to be limited mainly to the surface soil, but at much lower levels than those found at the site. No contaminants were found at levels above 0.25 mg/kg, with one exception. At A-SS15, the TNT concentration was 60 mg/kg. Since this does not correspond to with the other data found in these areas, it could be a bad data point. Again, zinc was found at elevated levels in both

surface and subsurface samples.

TABLE 5

SOIL SAMPLE CONCENTRATIONS ADJACENT TO SITE A [7]
(All concentrations are in mg/kg)

Samples Adjacent to Site A:

Surface samples:	A-SS01	A-SS02	A-SS12	A-SS13	A-SS14	A-SS15	A-SS16	A-SS17	A-SS18	A-SS19
Zinc	42	43	0.037	0.035	0.046	1.7	0.044	0.29	0.03	0.033
Di-n-butyl phthalate	0	0	0	0	0.096	0	0	0.57	0.14	0
Bis(2-eh)phthalate	0	0	0	0	0.11	0	0	0.76	0.14	0
Di-n-octyl phthalate	0	0	0	0	0.096	0	0	0.13	0.14	0
2,4,6-TNT	0.26	0	0	0	0.013	60	0.13	0.061	0.086	0
[illegible]T	0.004	0	0.029	0.035	0.014	0.85	0.017	0.033	0.029	0.019
[illegible]NT	0	0	0	0	0	0	0	0	0	0
[illegible]5-TNB	0	0	0	0	0	1.2	0	0	0	0
RDX	0.056	0	0.032	0.025	0.026	0.99	0.02	0.055	0.02	0.03

Subsurface samples: depth:	MW-26 (1 ft)	MW-26 (3 ft)	MW-26 (5 ft)	MW-39 (3 ft)	MW-39 (12 ft)	MW-41 (1 ft)	MW-41 (3 ft)
Zinc	24	23	24	23	35	22	20
Di-n-butyl phthalate	0	0	0	0	0	0	0
Bis(2-eh)phthalate	0	0	0	0	0	0	0
Di-n-octyl phthalate	0	0	0	0	0	0	0
2,4,6-TNT	0.005	0	0	0	0	0.004	0.005
2,4-DNT	0	0	0	0	0	0	0
2,6-DNT	0	0	0	0	0	0	0
1,3,5-TNB	0	0	0	0	0	0	0
RDX	0.003	0.002	0	0.03	0.004	0.043	0.053

One last area to address regarding soil contamination is the possible accumulation of pollutants in the sediments of Cattail Lake and the Hood Canal. Samples were taken from both areas and are shown in Table 6. As shown, zinc was the only contaminant of concern discovered. The concentrations of zinc found in Cattail Lake were 3 times as high as those found in the Hood Canal, and higher than almost all samples taken at Site A. Again, this

could be due to elevated background levels of zinc. This also holds true for the Hood Canal samples. To establish reference or background levels of contaminants, sediment samples were taken at various areas around the Hood Canal, some at a considerable distance from SUBASE Bangor. These samples also showed elevated concentrations of zinc. Therefore, it appears that the activities conducted at Site A did not contribute to the zinc levels found in the Hood Canal sediments.

TABLE 6

HOOD CANAL SEDIMENT DATA
(All concentrations are in g/kg)

sample location:	SW-10	SW-11	SW-12
Zinc	20	21	18
Di-n-butyl phthalate	0	0	0
Bis(2-eh)phthalate	0	0	0
Di-n-octyl phthalate	0	0	0
2,4,6-TNT	0	0	0
2,4-DNT	0	0	0
2,6-DNT	0	0	0
1,3,5-TNB	0	0	0
RDX	0	0	0

CATTAIL LAKE SEDIMENT DATA
(All concentrations are in mg/kg)

sample location:	SW-15	SW-16
Zinc	63	99
Di-n-butyl phthalate	0	0
Bis(2-eh)phthalate	0	0
Di n-octyl phthalate	0	0
2,4,6-TNT	0	0
2,4-DNT	0	0
2,6-DNT	0	0
1,3,5-TNB	0	0
RDX	0	0

Overall, contamination in the soil is generally restricted to the surface, particularly in the burn mounds. Otherwise, contaminants were found at low concentrations, if detected at all. Zinc is the only material found at elevated levels throughout the area.

Water

Numerous water samples have also been collected from Site A and the surrounding area. Figure 10 shows the location of selected groundwater and surface water sampling. Surface water samples were taken from monitoring wells drilled to a depth of only 2 to 5 feet, penetrating only the water zone contained on the surface. Sample locations for plant and shellfish tissue analysis are also shown on this map [2].

Surface water concentrations, taken at Site A and vicinity will be examined first, and are shown in table 7. The first part of the table shows the concentrations found at 4 monitoring wells directly on the site. As shown, the only consistent contaminant detected was TNT, with a high level of only 0.36 mg/l found at MW-04.

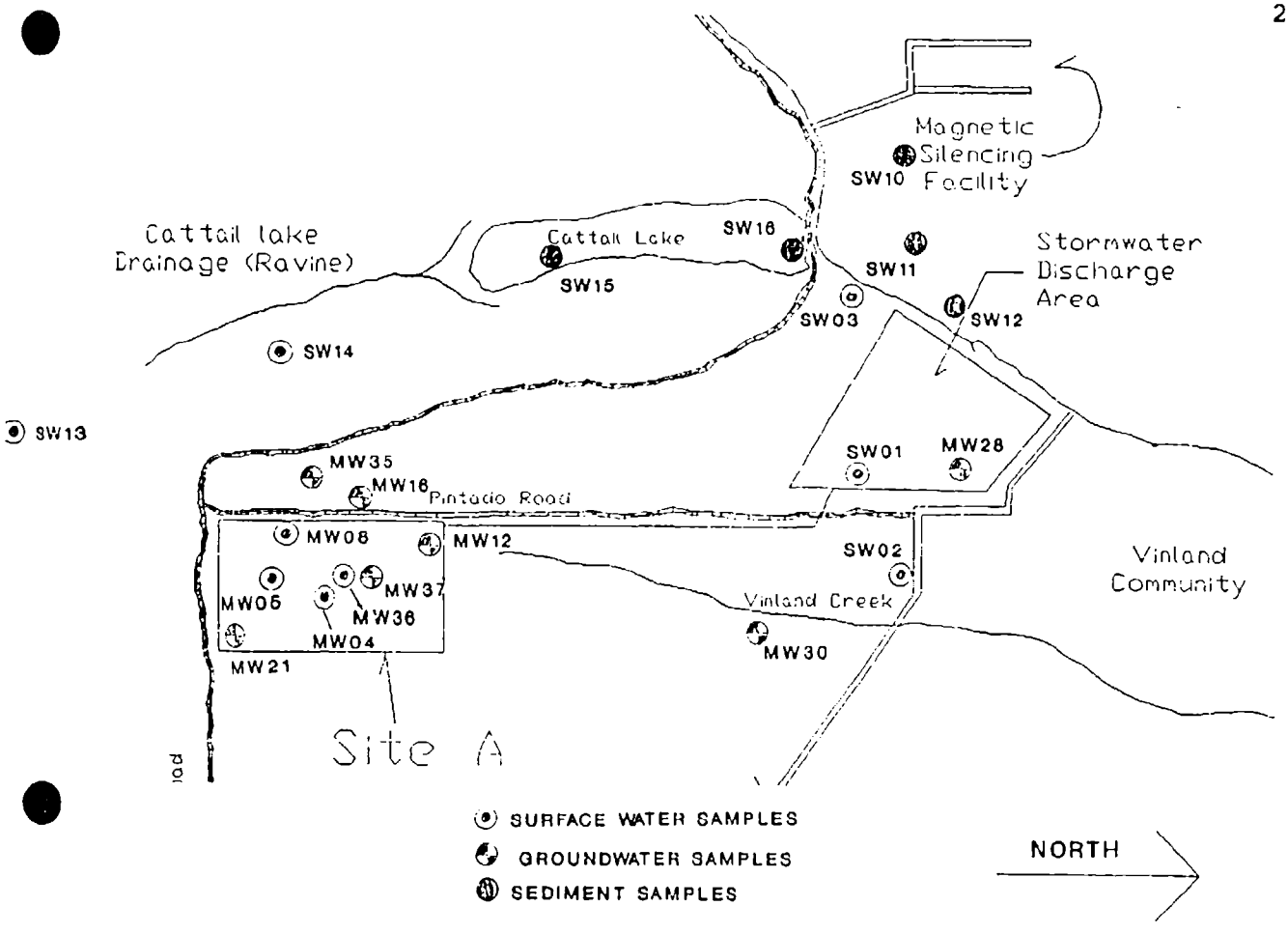


FIGURE 10 Surface and Groundwater sample plan [2].

TABLE 7

SURFACE WATER CONCENTRATIONS AT SITE A AND VICINITY[7]
(All concentrations are in mg/l)

Samples at Site A:

location:	MW-04	MW-05	MW-08	MW-36
Zinc	0	0	0	0.004
Di-n-butyl phthalate	0	0	0	0
Bis(2-eh)phthalate	0	0	0	0
Di-n-octyl phthalate	0	0	0	0
2,4,6-TNT	0.36	0.002	0.003	0
2,4-DNT	0	0	0	0
2,6-DNT	0	0	0	0
1,3,5-TNB	0	0	0	0
RDX	0	0	0	0.002

Samples adjacent to Site A:

location:	SW-01	SW-02	SW-07	SW 13	SW-14
Zinc	0.008	0.1	0.005	0	0
Di-n-butyl phthalate	0	0	0	0	0
Bis(2-eh)phthalate	0	0	0	0	0
Di-n-octyl phthalate	0	0	0	0	0
2,4,6-TNT	0.01	0	0	0	0
2,4-DNT	0	0	0	0	0
2,6-DNT	0	0	0	0	0
1,3,5-TNB	0	0	0	0	0
RDX	0.001	0.002	0	0	0

The data provided in this table was taken from samples analyzed in January, 1989. However, it should be noted that samples have been collected and analyzed consistently since 1980. While most contaminant levels have remained constant or decreased slightly, there has been a considerable drop in the concentrations of TNT. Figure 11 shows the decrease in the TNT levels. Although the data is somewhat limited, particularly

after 1984, there is a definite downward trend. This decrease seems to be the result of TNT partitioning onto soil particles at the site, which would also account for the consistent high levels of TNT in surface soil samples, shown earlier.

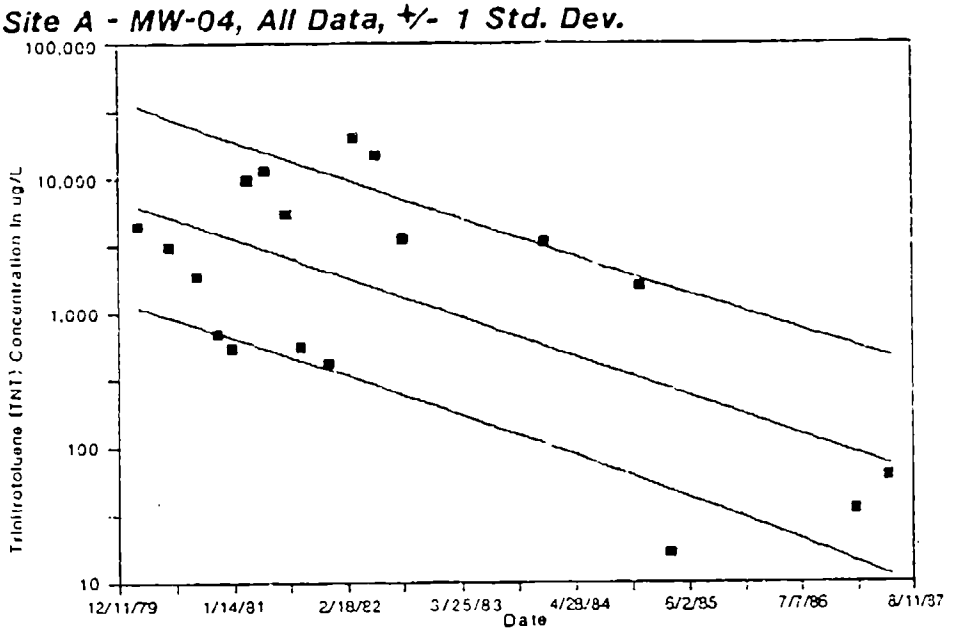


FIGURE 11 Graph of change in TNT concentration in groundwater [2]

The second part of the table shows values from samples taken in the ares surrounding the site. Referring back to figure 10, SW-01 through SW-03 are located to the north of the site (SW-01 is located at the exit from the surface water diversion facility), and SW-13 and SW-14 are located in the Cattail Lake drainage area. As shown, all contaminants that were detected were found at relatively low concentrations. In addition, pollutants were detected only in SW-01, SW-02, and SW-03. This shows that contamination in surface water tends to migrate north and not toward Cattail Lake. Also, since more contaminants were

found in SW-01 than any other sampling location, it appears that the surface water diversion structure has been successful in diverting surface runoff away from Cattail Lake.

Table 8 shows the contaminant concentrations found in groundwater at Site A and the surrounding area. In all cases, the only contaminant detected was RDX, which was found at relatively low levels. In most cases, the concentration did not exceed 0.002 mg/l. However, the level detected at MW-37 was 0.065 mg/l, over 30 times higher than any other sample. Looking at the location of this monitoring well, this is not surprising, since MW-37 is located directly on one of the burn mounds at the site.

Because RDX was detected in all monitoring wells adjacent to Site A, the direction of migration of the contaminants is not clear. However, the concentrations of RDX decrease as the distance from the site increases.

Groundwater samples were also collected from 8 domestic wells located outside SUBASE Bangor in the Vinland Community. However, no contaminants were detected in any of these locations [2].

TABLE 8

GROUND WATER CONCENTRATIONS AT SITE A AND VICINITY [7]
(All concentrations are in mg/l)

Samples at Site A:

location:	MW-12	MW-16	MW-21	MW-37
depth:	(85 ft)	(110 ft)	(91 ft)	(78 ft)
Zinc	0	0	0	0
Di-n-butyl phthalate	0	0	0	0
Bis(2-eh)phthalate	0	0	0	0
Di-n-octyl phthalate	0	0	0	0
2,4,6-TNT	0	0	0	0
2,4-DNT	0	0	0	0
2,6-DNT	0	0	0	0
1,3,5-TNB	0	0	0	0
RDX	0.002	0.0006	0.0064	0.065

Samples adjacent to Site A:

location:	MW-28	MW-30	MW-35
depth:	(89 ft)	(100 ft)	(90 ft)
Zinc	0	0	0
Di-n-butyl phthalate	0	0	0
Bis(2-eh)phthalate	0	0	0
Di-n-octyl phthalate	0	0	0
2,4,6-TNT	0	0	0
2,4-DNT	0	0	0
2,6-DNT	0	0	0
1,3,5-TNB	0	0	0
RDX	0.0002	0.005	0.001

Bioaccumulation

The final media to be discussed is the possible bioaccumulation of contaminants in aquatic life and plant tissue. Aquatic life will be addressed first. Trout from Cattail Lake and clams and oysters from the Hood Canal were analyzed. The only contaminant found in any sample was zinc. The

concentrations in Cattail Lake trout ranged from 9 mg/kg to 26 mg/kg. The concentrations in shellfish ranged from 9 mg/kg to 220 mg/kg, with the highest concentrations detected in samples taken closest to the stormwater discharge area. No ordnance contaminants were detected [2,7].

Plant tissues concentrations, from samples collected at various locations at the site, are shown in table 9. Samples were taken from quack grass and common velvet grass found at the site. The contaminants with the highest concentrations detected were zinc and bis(2-ethylhexyl)phthalate. There were also small amounts of TNT and RDX found in some samples. This is not surprising since accumulation in plants is known for both compounds [7].

TABLE 9

PLANT TISSUE CONCENTRATIONS AT SITE A [7]
(All concentrations are in mg/kg)

Sample number:	PT-1	PT-2	PT-3	PT-4	PT-5	PT-6	PT-7	PT-8	PT-9
Zinc	6	6	9	5	7	5	5	7	6
Di-n-butyl phthalate	0.53	0.5	0.7	0.67	0.67	1.1	0.66	1.3	0.98
Bis(2-eh)phthalate	16	2.9	0	0	0	15	18	0	7.7
Di-n-octyl phthalate	0	0	0	0	0	0	0	0	0
2,4,6-TNT	0	0	0	0	0.11	0.14	0.11	0.053	
2,4-DNT	0	0	0	0	0	0	0	0	0
2,6-DNT	0	0	0	0	0	0	0	0	0
1,3,5-TNB	0	0.035	0	0	0	0	0	0	0
RDX	0	0	0.2	0	0	0.034	0	0	0

SURFACE WATER CHARACTERISTICS

In this section, the surface water features of Site A and the surrounding area will be discussed, including surface runoff

and recharge to groundwater aquifers. To get a picture of surface water flow around the site, a water balance is necessary to determine the possible impacts on surface and groundwater. According to the National Oceanic and Atmospheric Administration (NOAA), the precipitation contributing to Site A is approximately 47 inches per year, or an annual total of 24.7 million gallons for the site. Of this total, almost half, or 10.1 million gallons is lost to evapotranspiration, the combined term for evaporation and transpiration. Transpiration, in itself, is difficult to measure as it is a function of the number and types of plants, soil type, season, and temperature [9]. The remaining amount, 6 million gallons to groundwater recharge and 8.6 million gallons to surface runoff, is interesting because, as shown in earlier sections, these are possible routes of contaminant migration.

The area contributing surface runoff to Site A is roughly 19 acres in size and is shown in figure 12. After this water reaches the site it flows to one of three areas, also shown in the figure. The first is Cattail Lake drainage, a small stream to the southwest of Site A. This area of surface runoff is important because this stream flows directly into Cattail Lake, and could therefore be a pathway for contamination. Surface runoff cannot reach Cattail Lake (shown in figure 13) directly because the area between Site A and the lake is at a higher elevation than the site. In addition, the soil between Site A and Cattail Lake is not as permeable as the soil to the north of

Site A. Therefore, any surface water contributing to groundwater recharge is more likely to percolate toward the Hood Canal, rather than the lake [2].

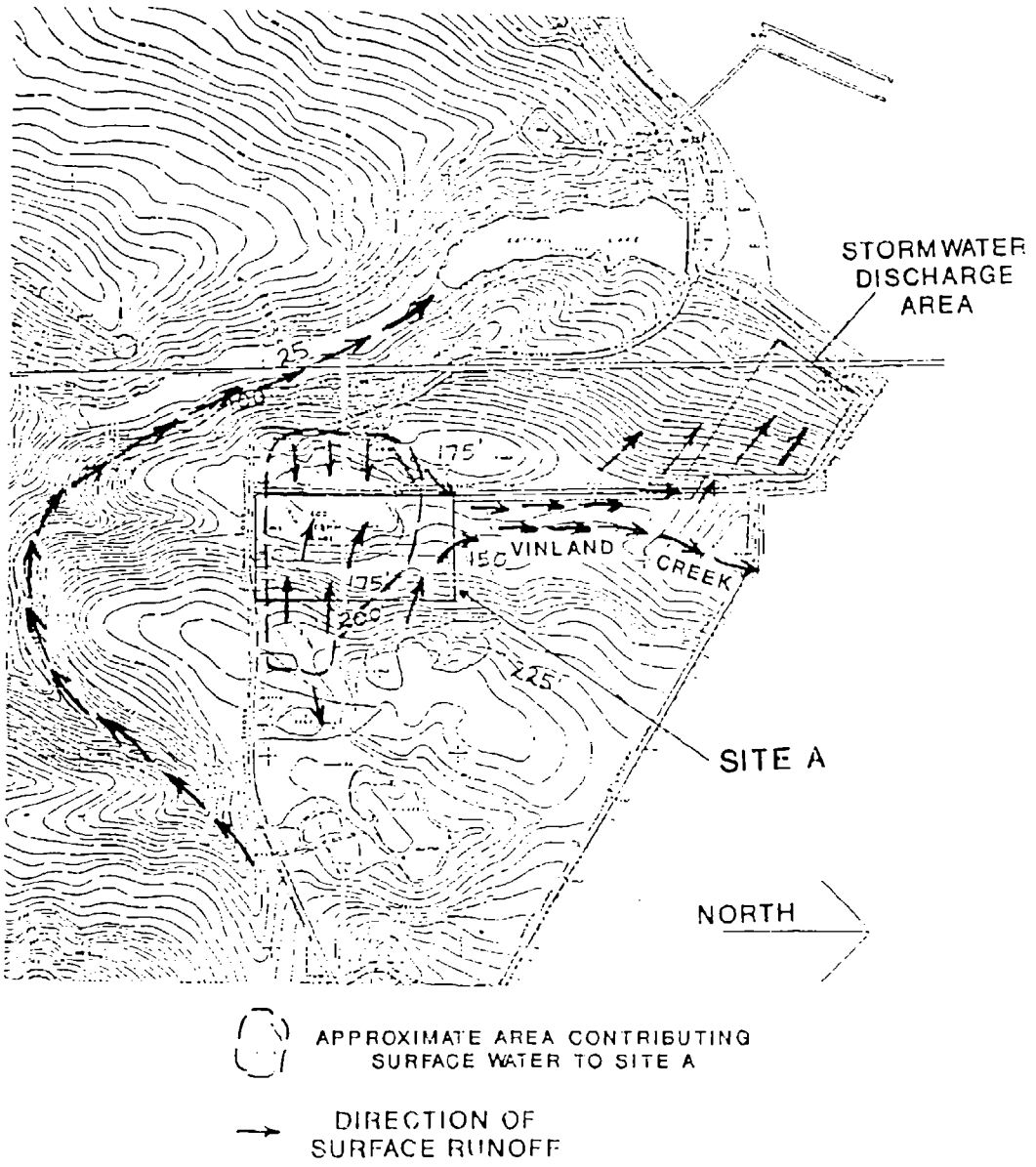


FIGURE 12 Map of surface water drainage at Site A [2].

The second surface discharge area is Vinland Creek, located directly north of Site A. This creek leaves SUBASE Bangor, flows through the Vinland community, and discharges directly to the Hood Canal, and therefore could contribute to the migration of contaminants to the Hood Canal.

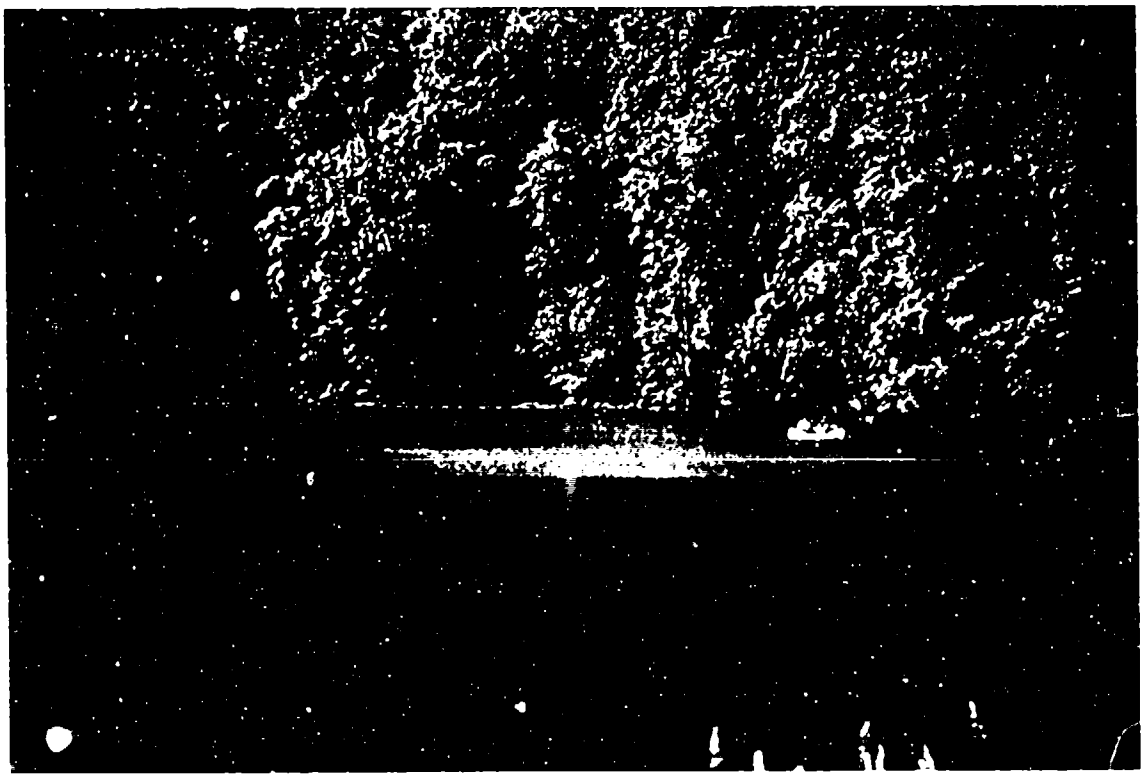


FIGURE 13 Photograph of Cattail Lake.

The final area of surface runoff is the stormwater discharge area, located to the north and west of the site. A storm water diversion facility was constructed in 1983 to direct water through a drain pipe to a stormwater discharge area. The stormwater percolates through 700 to 800 feet of semi-permeable soil in this discharge area before entering the Hood Canal, so some filtration is possible [2,7]. Figure 14 shows the inlet to the diversion structure. Figure 15 shows the route of the

structure along Pintado Road, and figure 16 shows where the water exits the structure. Finally, figure 17 shows the area between the discharge area and Hood Canal.

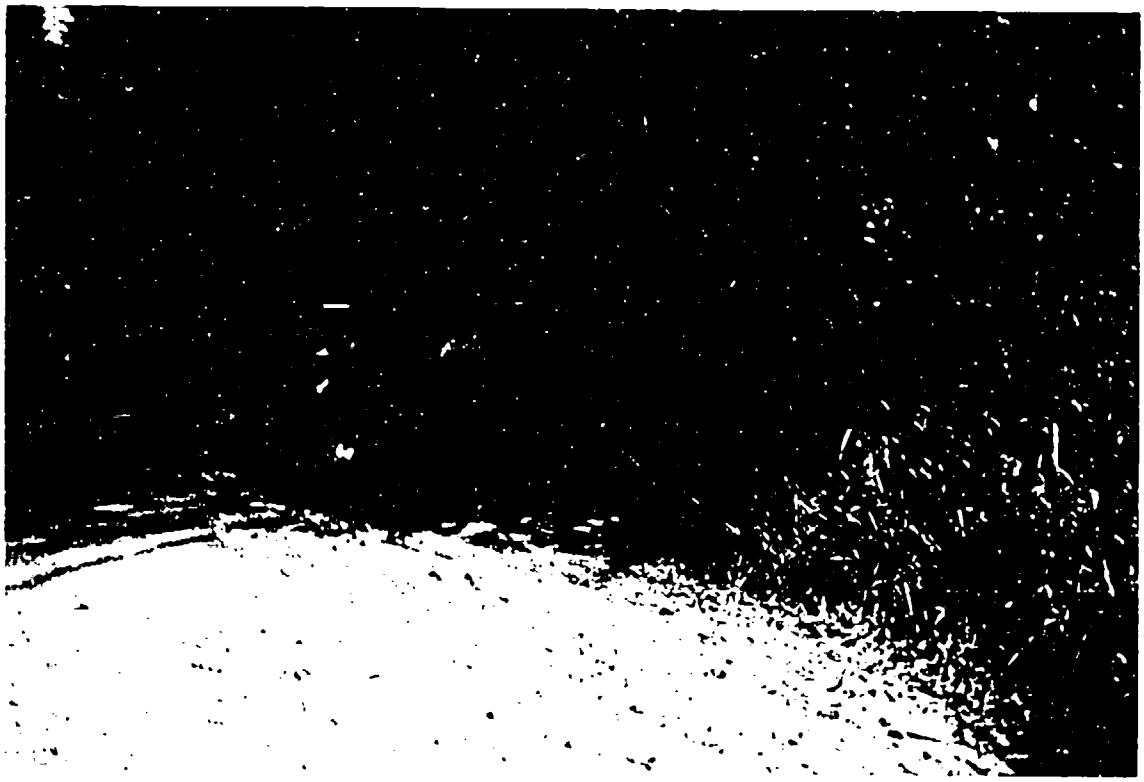


FIGURE 14 Photograph of inlet to surface water diversion facility

marked MW**, are for monitoring purposes only, and are not used for withdrawal. A photograph of one such well is provided in figure 20. It is also important to note that the boundaries between geologic layers are questionable. Most of these boundaries are based on interpolation between known data points [2]. This is a significant point to remember when examining the potential for migration of the contaminants found at Site A, and will be discussed in later sections of this paper.

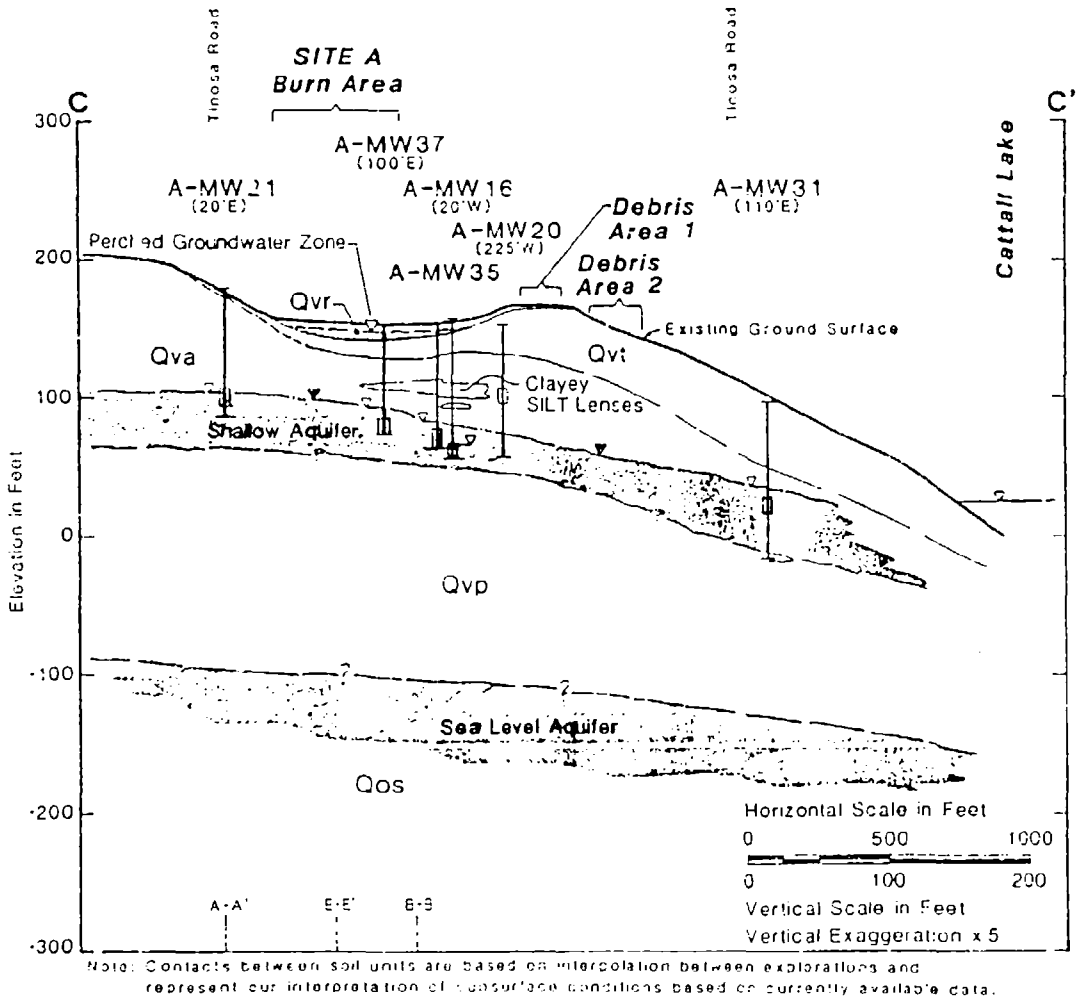


FIGURE 18 Cross-section of Site A to Cattail Lake [2].

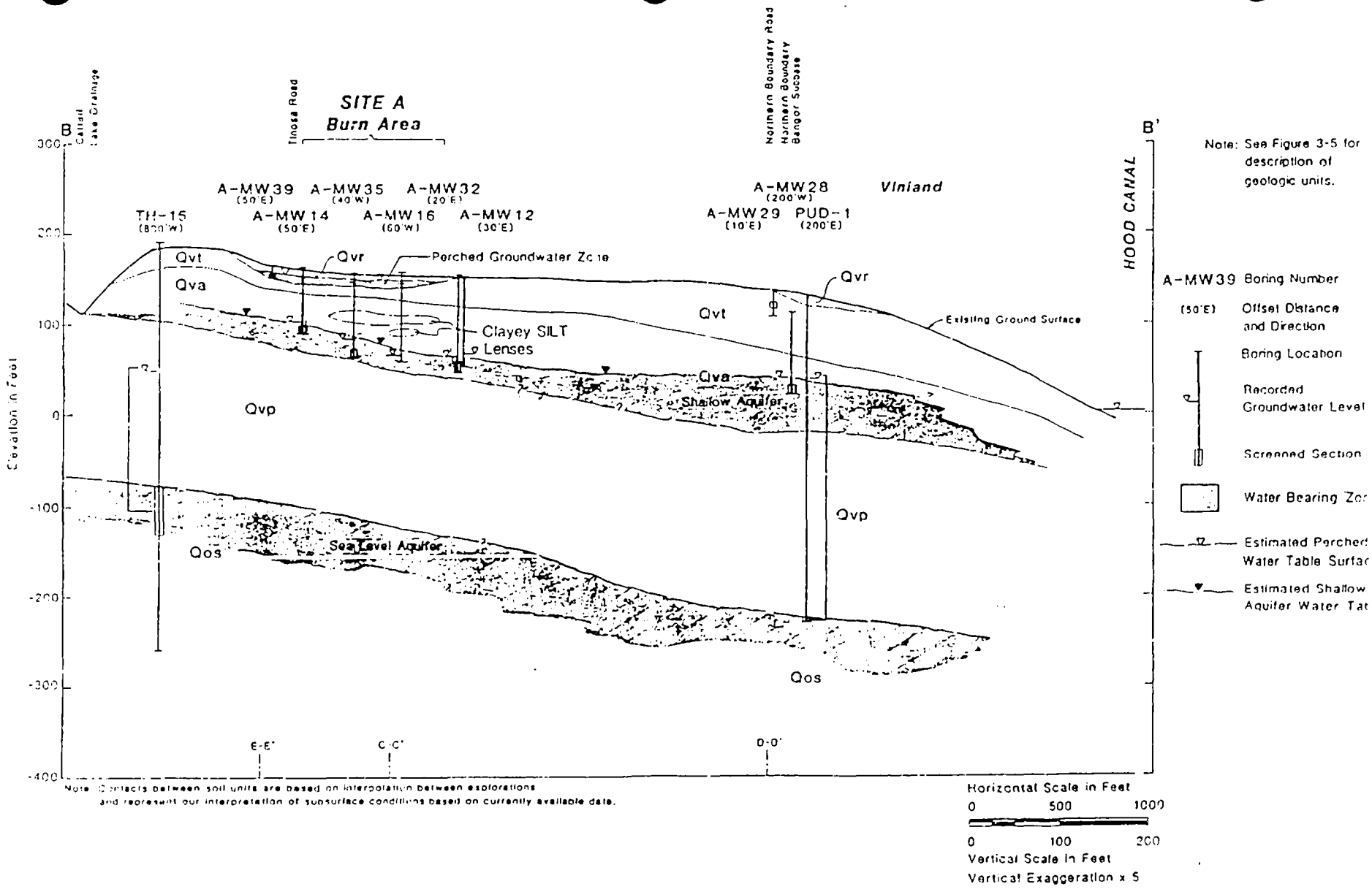


FIGURE 19 Cross-section of hydrogeologic features, Site A to the Hood Canal [2].

FIGURE 20 Photograph of a typical monitoring well at Site A.

The physical characteristics of each hydrogeologic unit are provided in table 10, for easy comparison of each layer. Now each will be discussed separately, beginning at the surface and descending respectively.

TABLE 10

SUMMARY OF HYDROGEOLOGIC ZONE CHARACTERISTICS [2,7]

ZONE	SYMBOL	DEPTH (ft)	THICKNESS (ft)	HYDROL. COND (ft/day)	RE/DISCHARGE	AQUIFER?	SOIL TYPE	POROSITY
Vashon Recession Outwash	Qvr	0	10-20	0.20-1	By precip. and surface runoff	Yes (6W Zone)	Slightly Sil Gravelly SAND	0.2
Vashon Till Zone	Qvt	0-20	10-30	0.003	?	No	Very dense, Very silty SAND	?
Vashon Advance Outwash	Qva	25-45	50-135	0.14-1.4	By Qvr and local water-shed To Cattail Lk and Hood Canal	Yes (Shallow Aquifer)	Medium to fi sand, very sandy SILT	0.25
Kitsap Formation Upper Lacustrine Silt	QK	50-100	140-350	?	?	No	Clayish sandy SILT	?
Older Sand Gravel	Qos	250-350	200	50-100	To Hood Canal	Yes (Sea Level Aquifer)	Sand and Gravel	?

The first zone to be discussed is the Vashon Recession Outwash (Qvr). This unit has scattered deposits of unconsolidated sand and gravel, and some thinner silt layers directly on top of the underlying zone. As a result, it does have the ability to hold groundwater, and is referred to as the Perched Groundwater Zone [7]. This layer is a seasonal unit, because its thickness increases during the wet winter months and decreases during the summer months. During very dry periods it can completely dry up in the area directly under Site A. Because this layer is limited in size and somewhat seasonal, there are no withdrawal wells tapped into this zone [2].

Since it is on the surface, this layer is recharged by precipitation and surface runoff. The flow in this layer is toward the northwest, to the stormwater discharge area and Hood Canal. The transmissivity through this zone is low, at only 0.01. This zone consists of glacial till, with a porosity of roughly 0.2 [2].

The second hydrogeological unit, lying just under the Qvr zone and extending to a depth of roughly 20 feet, is the Vashon Till Zone (Qvt) which is a very dense, poorly mixed layer of sand, silt, and gravel. Because this layer is not homogeneous, permeability is low, particularly in areas with more silt. It generally acts as an aquitard, but does contain small pockets of groundwater in areas where its constituents are better mixed. In the area of Site A, it is more consistently mixed than in other areas, and does have pockets of water during the wet season.

The depth of the Vashon Till zone (Qvt) varies, depending on its location (i.e. it is exposed to the surface in some areas). In addition, this zone has a much larger surface area than the overlying layer [2].

The third hydrogeologic zone is the Vashon Advance Outwash (Qva). This layer consists of well-stratified gray to brown sand with scattered pockets of silt and gravel. It is a partially confined water bearing zone, containing the Shallow Aquifer. This zone supplies several private wells in the Vinland community, thus contamination is of great concern. The Vashon Advance

Outwash appears to have a large surface area.

Recharge to this layer is from percolation from the Perched Groundwater Zone and from local watershed to the aquifer. The hydraulic conductivity varies from 0.14 to 1.4 feet per day [2]. Discharge flows to Cattail Lake Drainage and the Hood Canal [7].

The Kitsap Formation-Upper Lacustrin[illegible] Zone (Qk) consists of hard, gray sand laminated to massive silt, and is characterized by fine material and low hydraulic conductivity. It is relatively impermeable and acts as an aquitard between the Shallow Aquifer and the underlying layer. A few intermediate groundwater aquifers do exist within this zone, but are restricted from recharge and discharge. Regarding size, the Qk zone is larger than any overlying units [2,7].

The final hydrogeologic zone to be addressed is the Older Sand and Gravel Zone (Qos), which consists generally of sand and gravel, with smaller amounts of silt and till in some areas. It contains the Sea Level Aquifer, which is the supply zone for Public Utility District No. 1 (containing two well systems).

Located at a depth of between 100 and 200 feet below sea level (or 250 to 350 feet from the surface), discharge from this aquifer flows to the Hood Canal.

SUMMARY OF SITE A CHARACTERISTICS AND IMPACTS

Human exposure

A major concern for any hazardous waste site is the potential for human exposure and the possible effects. Now that Site A has been characterized, this aspect of an RI will be

addressed. Possible pathways for human exposure from Site A are listed below and the potential of exposure for each of them is discussed:

1. Drinking water - This is the primary pathway for ordnance compounds to reach humans, which could be significant since there are elevated levels of some contaminants in groundwater. This is why the rate and direction of migration in groundwater must be carefully studied.

2. Consumption of shellfish - Elevated concentrations of some ordnance compounds and metals were detected in shellfish samples. However, there is not enough data to make any quantified conclusions about this pathway. As a conservative measure, the beaches around discharge points from Site A have been closed to shellfishing.

3. Dermal contact - An important pathway, which would occur if soil from the site got onto exposed skin. As a result, Site A has been fenced in to prevent unauthorized entry, and there are strict clothing and safety restrictions for those who are permitted access. Revegetation at the site has also reduced the chance for dermal contact with contaminated soil.

4. Inhalation of compounds - This is similar to dermal contact in that contaminated soil particles would be inhaled through the lungs. Again, the restricted access has reduced the possibility of this happening.

Site A summary

The sampling conducted at Site A shows that contamination

has migrated through soil, surface water, and groundwater. The highest levels of contamination are limited to the soil media, in particular, surface soils directly on the site. However, there are elevated contaminant levels (zinc, TNT, 2,4 DNT, and RDX) in soil samples adjacent to the site, showing a migration pattern toward the Cattail Lake drainage ravine. Because of the low Kd partitioning values of these compounds, high soil concentrations are expected.

Contamination in surface water is different from that of soil. Both TNT and zinc were detected in surface samples but at relatively low concentrations. Based on sampling data, contaminant migration in surface water is moving toward the stormwater discharge area, showing the success of the stormwater diversion structure in directing the flow of surface runoff.

The only contaminant detected in groundwater was RDX, found in samples both on and adjacent to Site A. However, concentrations were low, possibly due this compounds low solubility and high affinity for sorbing onto solids.

Contaminant in sediment and plant tissues is limited to zinc. But there were also elevated concentrations of phthalates in plant tissue.

Based on the sampling conducted at Site A and vicinity, the majority of the contamination is limited to the soil media,, with small levels occurring in surface and groundwater. Although some conclusions about contaminant migration can be made with the available data, they are only quantitative (i.e. direction of

flow only, no flow rates). The fact that migration cannot be quantified with the existing data is one of the limitations of the sampling done at this site.

COMPUTER MODELING

Why use models?

For years computer models have been used to simulate situations in the real world. One of the benefits of modeling is that they provide a simple and economically feasible way to look at various scenarios without extensive field work. The idea of modeling can also be applied to hazardous waste sites. While field sampling is still required to obtain the amount and concentrations of contaminants at a site, it is often difficult to determine the migration patterns and flow rates of contaminants from that site. Computer modeling of hazardous waste sites can help in determining the migration potential of contaminants, specifically in groundwater.

Chu et al. (1987) examined the data requirements for groundwater modeling. In this study, they were given a limited amount of data for a hypothetical aquifer. Their objective was to "evaluate the effects of data availability and uncertainty on parameter estimation for groundwater contaminant transport." In other words, they wanted to see how closely the model could simulate contaminant migration in the test aquifer. The computer model used in this study was the U.S. Geological Survey's Method of Characteristics (USGS-MOC) [1]. This widely-used model is so named because it uses the method of characteristics to solve the

solute transport equation in the model, a method developed to solve hyperbolic differential equations.

The results showed that the ability of USGS-MOC (and therefore similar computer models) to predict contaminant migration is limited by the extent and the quality of the data provided for the aquifer. According to Chu,

> "The predictive ability of such numerical models is limited by the assumptions and approximations introduced in the governing equations and their solutions, the model parameter values used, the availability and quality of the data for model calibration, and the characteristics of the physical system." [1]

Since modeling appears to be restricted by data requirements, why use them? Again referring to Chu, while simulation models may be limited by data requirements, they do "offer a valuable tool for groundwater contamination assessments." [1] The bottom line is that as long as model results are accompanied by some uncertainty analysis, they provide a method to predict the migration patterns of contaminants from hazardous waste sites.

Why model the site?

There are three significant advantages to applying USGS-MOC to Site A. First, after reviewing the existing information for the site, it is clear that while extensive sampling was done, there are still questions regarding contaminant migration,

particularly in groundwater. These questions must be answered before an accurate evaluation can be made. Secondly, using the model is an easy way to vary unknown parameters and look at the effects on contaminant migration. It should be noted that modeling different scenarios will not provide a complete, accurate picture of the site. But by changing the parameters where data is limited and examining the effects, I can determine which factor (i.e. aquifer thickness, transmissivity, etc) has the largest control over migration patterns. This leads to the third advantage. Finding the factor with the most control on migration will show where efforts should be concentrated in further field study or development of remediation alternatives.

To model Site A, USGS-MOC will be applied to the shallow aquifer under the site. Because the perched groundwater zone is seasonal and directly on the surface, it is easily accessible for sampling and will not be used in the modeling exercise. The sea level aquifer will also not be used as it is not effected by the contamination at the site. On the other hand, the shallow aquifer is subject to contamination, and does supply water to several domestic wells in the Vinland area.

The model results will not provide a complete and accurate evaluation of Site A. However, it will be a good demonstration of this groundwater model, and meet my objective of gaining experience with computer models.

USGS-MOC

USGS-MOC, used in Chu (et al.)'s study, is a popular

groundwater model used for predicting contaminant migration. In order to examine the set-up of this model, the basics of groundwater flow, as seen in USGS-MOC, should be addressed. Groundwater flow in an aquifer is a combination of four processes, which are listed below:

1. Convective transport.
2. Hydrodynamic dispersion.
3. Combination of fluid sources - when water of one composition comes in contact with water of another composition.
4. Reactions - chemical reactions of the solute and surrounding substances, including sorption onto solids, ion exchange, biological reactions, etc.

In USGS-MOC, the groundwater flow equation is coupled with a solute-transport equation to analyze flow in a simulated aquifer. However, there are limitations to using this model. First, USGS-MOC is applicable to one and two dimensional flow problems, only. Second, it is limited to either transient flow or steady state flow. The third limitation is that the model assumes that the solute in question is non-reactive and that fluid density, viscosity, and temperature do not affect the velocity distribution. Lastly, the boundary conditions of the aquifer to be modeled must be chosen carefully.

When establishing specific boundary conditions, they may be either constant-head boundaries or constant-flux boundaries. A constant-head boundary is a location where the head does not

change with time. It may be the true aquifer boundary, or an artificial boundary set for modeling purposes only. A constant-flux boundary can represent aquifer underflow, or well injection or withdrawal. Modes of aquifer recharge or discharge (i.e. by percolation from rainfall, etc) are ignored in the model. Once these boundaries are set, the area within them represents the aquifer. This area is called a finite-difference grid, so named because "a finite-difference equation describing the effects of hydrodynamic dispersion, fluid sources and sinks, and divergence of velocity" [6] is used in the model. The grid consists of a set of rows and columns of nodes, with each node representing a certain area of the aquifer. The outer rows and columns of the grid represent no-flow boundaries (i.e. the constant-head or constant-flux conditions in the aquifer). Since calculations are made at each node for every time increment in the model run, the grid is limited to no more than 20 rows and columns, or 400 nodes. In addition, since the outer nodes are considered the no-flow areas, the aquifer, itself, is limited to 18 rows and columns, or 324 nodes [6]. An example of this grid is shown in figure 21.

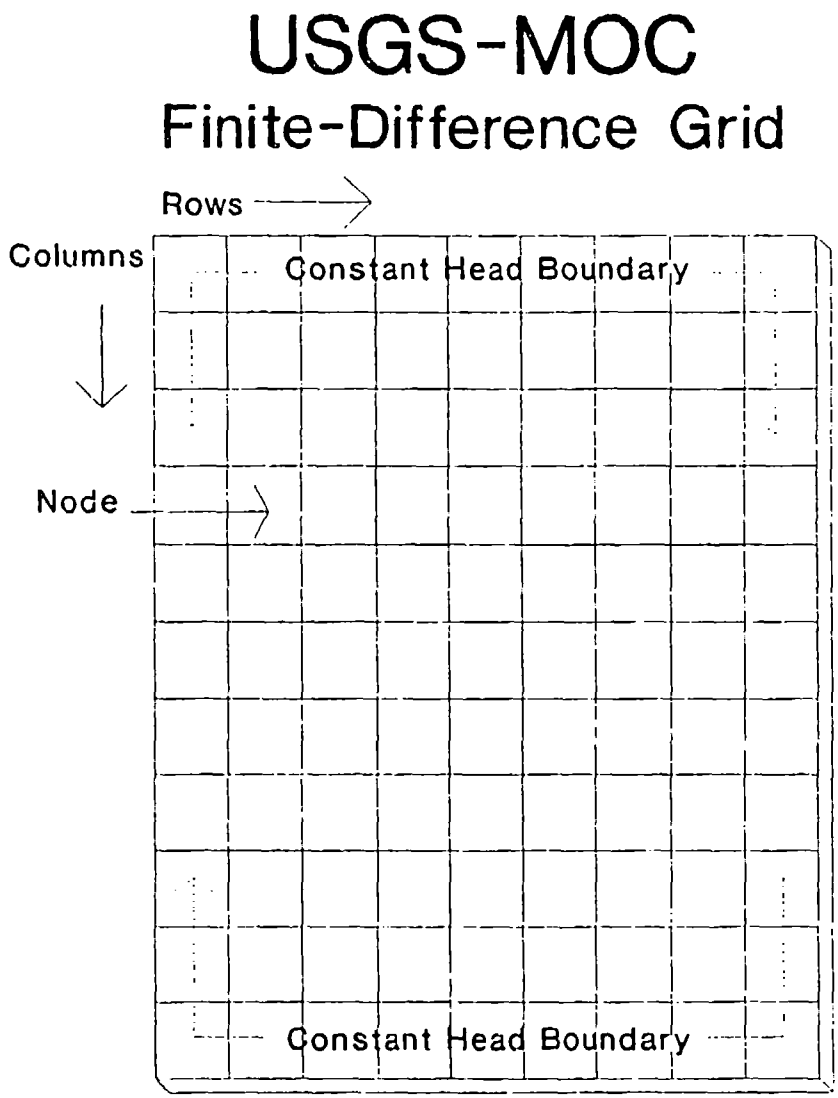


FIGURE 21 Finite-difference grid for computer model USGS-MOC [6].

This model allows for four, five, eight, or nine tracer particles to be used per node. These particles are used to calculate the concentration of contaminant in each node at each chosen time increment. Initial particle distributions are shown

in figure 22. The best results, with the least amount of error in the chemical mass balance, are obtained if nine particles per node are used [6].

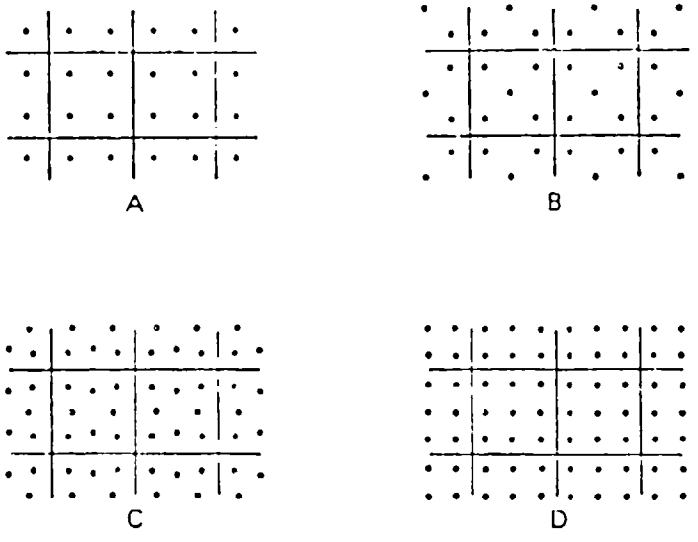


FIGURE 22 Particle distribution for finite-difference grid [6].

One other source for mass balance error is the node or cell distance (CELDIS in the model), or the distance the solute travels within each node over one time increment. Verification test runs show that the least error and best results occur when CELDIS is set to 0.5, or half the distance of one node. However, there is little variation between setting CELDIS equal to 0.5 or 1. The bottom line is that the distance of solute transport during one time increment should be at least half the node distance, and no lower [6].

Any number of injection or withdrawal wells can be used in USGS-MOC. However, only one well may be placed per node. If more than one well exists within one node, the average rate of recharge or withdrawal must be used for all wells in that region.

The number of observation points, or monitoring wells, is limited to five [6]. These are used to examine the variation in concentration at any one point over the entire time period specified for the program. They may be placed anywhere within the grid area, with the exception of the no-flow regions.

MODELING SITE A

Input data

In order to apply the model to the shallow aquifer, the input data should represent the actual site as closely as possible. To do this, the finite-difference grid was set up to simulate the area in figure 23. This map shows Site A, the Hood Canal, and the Vinland wells. An outline of the proposed grid is also shown in this figure. It can be compared to figure 24, which is the model representation of the same area. On the grid, Site A is in the same location, relative to the Vinland wells and the Hood Canal. Because of the limited grid area, only five withdrawal wells are used. The Hood Canal is represented by the constant-head boundaries on the northern and western edges of the grid. The southern and eastern edges are artificial boundaries used for modeling purposes. In addition, there are four observation points on the grid. These will be used to compare the results of the various test runs of the model.

Table 11 shows the known input parameters used when modeling Site A. These values were chosen because they provide a somewhat accurate simulation of the site. The pumping rates for the withdrawal wells in Vinland are estimates based on personal

interviews with owners of private wells and water consumption data from Public Utilities District #1 (PUD 1). Note that two pumping rates are shown. One represents withdrawal for household use, and the other is the rate required for irrigation.

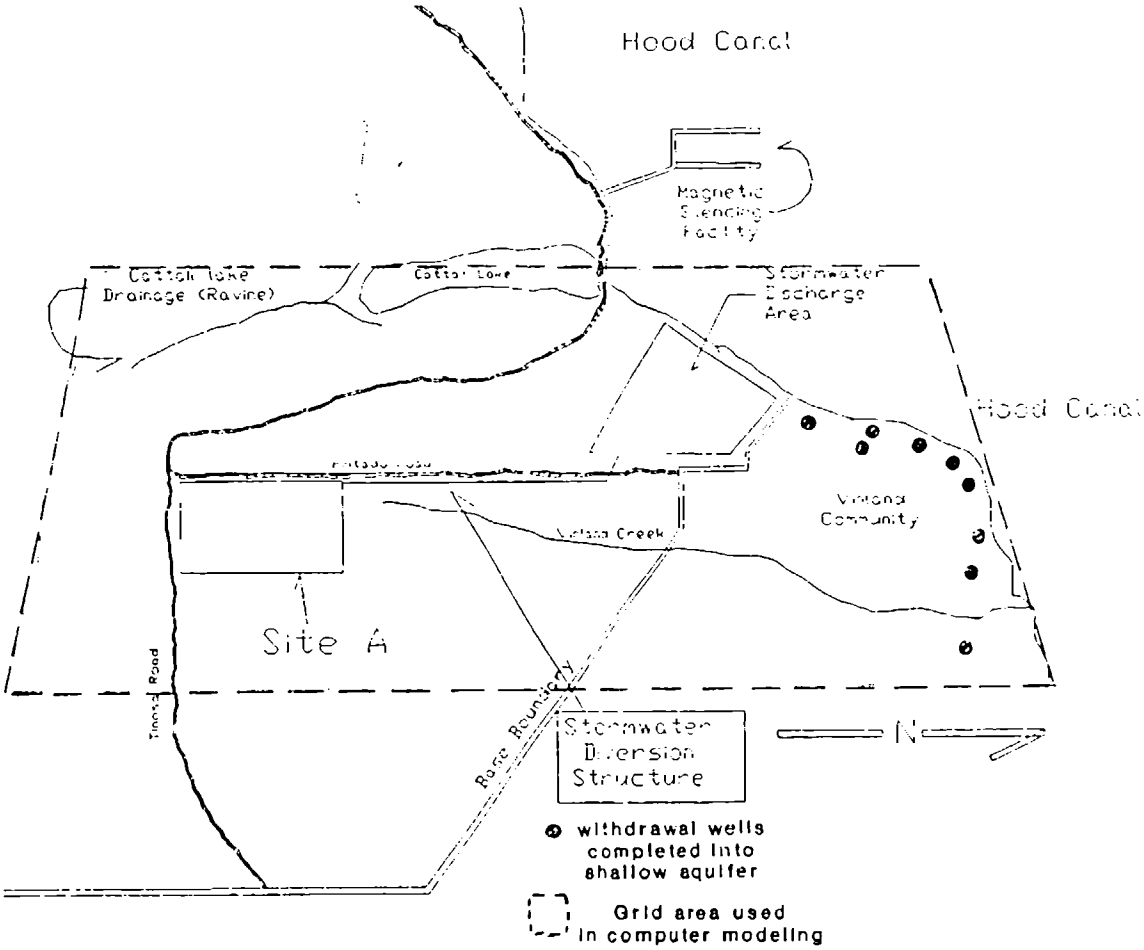


FIGURE 23 Map of Site A in relation to Hood Canal and Vinland area wells [2].

MODELING SITE A
Program -- USGS MOC

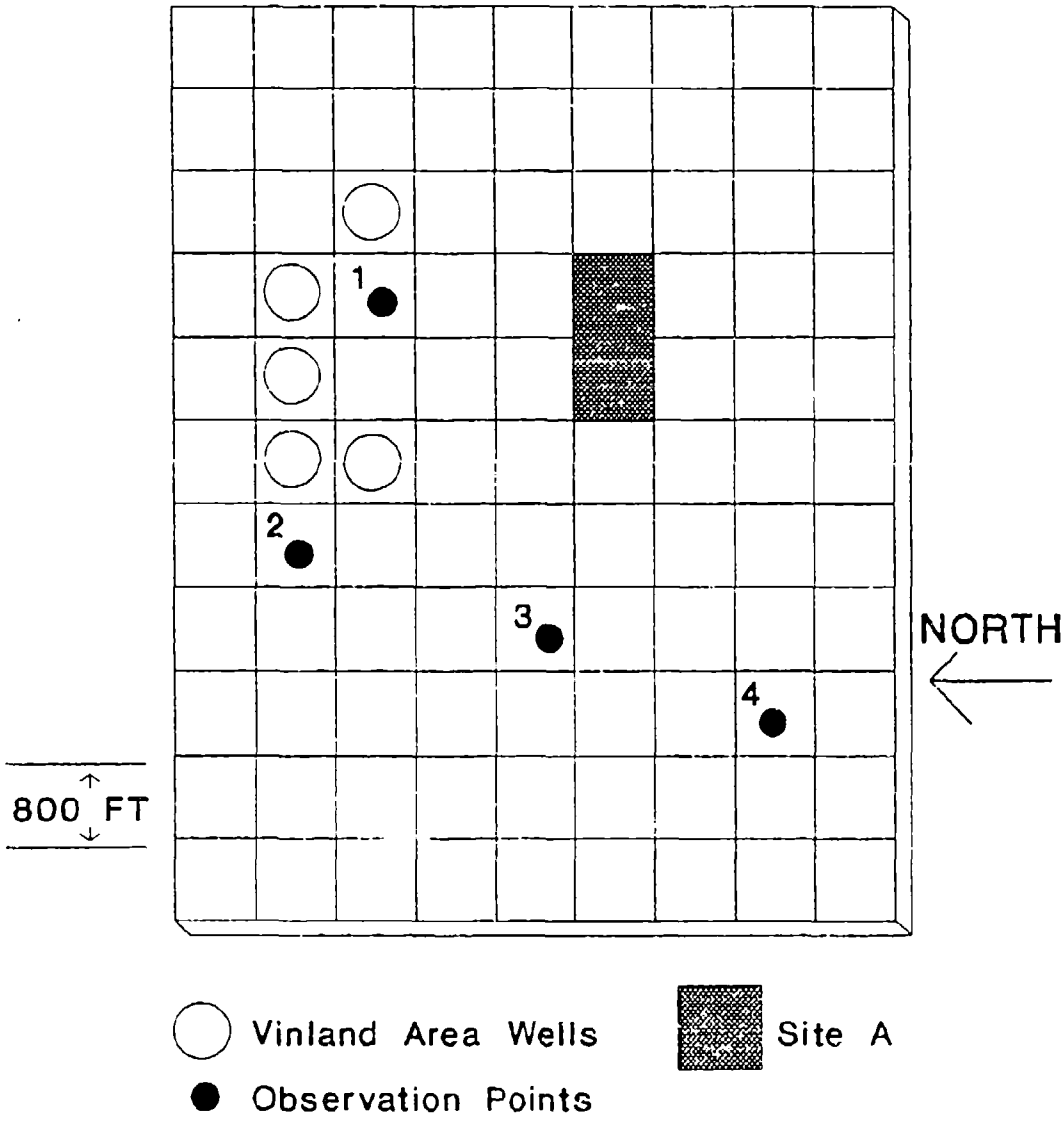


FIGURE 24 Finite-difference grid applied to Site A.

TABLE 11

KNOWN INPUT PARAMETERS FOR MODELING SITE A [2,6].

Parameter	Setting	Units (If Applicable)
# of cells, X direction	9	
# of cells, Y direction	11	
Width of each cell	800.0	feet
# of observation points	4	
# of withdrawal wells	5	
Pumping rate for wells	0.01 10.0	cf/sec
Soil porosity	0.25	
Selected run time	5.0	years
Initial concentration of contaminant in aquifer	0.0	mg/L
Initial concentration of contaminant at source	100.0	mg/L

Since my objective was to compare results for various test runs, and not to obtain actual migration rates, the time selected for running the model was 5 years. The initial concentration of contaminant at the source (Site A in this case) was set at 100 mg/L. This figure was chosen because it relates to the solubility of 2,4,6-TNT, a contaminant of concern in groundwater. Although well above the concentrations of contaminants detected at Site A, this initial concentration was chosen so the results would emphasize the potential for migration from the site to surrounding areas.

There are four aquifer characteristics which are unknown or

roughly estimated based on limited data. They are dispersion ratio, aquifer thickness, water table height, and transmissivity. During the model runs, these parameters were changed one at a time in order to examine the effects of each on migration, resulting in a total of five test runs of USGS-MOC. Table 12 shows the values chosen for each test run. The varied parameter values in runs 2 through 5 were chosen based on a range of estimates listed in the Current Situation Report. For example, the aquifer thickness is known to be between 25 and 45 feet, so the standard run uses 25 feet and the variation uses 45 feet.

To run the model, data is placed in an input file. A sample input file, with explanations for each term, is in appendix 2. The input file is made up of three data cards (named from a time when computers required cardboard cards for input, the name was never updated) and nine data sets. Files may be changed and saved with most word processing programs.

TABLE 12

MODELING SITE A, TEST RUN DATA

Test No. 1: Standard Run

Withdrawal Wells	5
Dispersion Ratio	0.3
Transmissivity	0.14
Aquifer Thickness	25
Water Table height	50

Test No. 2: Dispersion Ratio

Withdrawal Wells	5
Dispersion Ratio	0.9
Transmissivity	0.14
Aquifer Thickness	25
Water Table height	50

Test No. 3: Aquifer Thickness

Withdrawal Wells	5
Dispersion Ratio	0.3
Transmissivity	0.14
Aquifer Thickness	45
Water Table height	50

Test No. 4: Water Table

Withdrawal Wells	5
Dispersion Ratio	0.3
Transmissivity	0.14
Aquifer Thickness	25
Water Table height	135

Test No. 5: Transmissivity

Withdrawal Wells	5
Dispersion Ratio	0.3
Transmissivity	0.04
Aquifer Thickness	25
Water Table height	50

Results of modeling

When a test run is completed, the results are placed into an output file. Because of the number of time increments required for each run, these files are quite lengthy. Unfortunately, in

USGS-MOC, the time increments for calculations cannot be changed. However, the output file can be edited in a word processing program after the run is completed. A complete sample output file for test run number one (standard) is in appendix 3. Output files include grids showing the concentration and changes in concentration for each time increment. The model also calculates the chemical mass balance for each time increment and places it in the output file, as well. In addition, the concentration and head at each selected observation point is shown for each time increment.

As stated in the introduction, one of the main objectives of this paper is to examine and compare the specific results for the five test runs involving Site A. Therefore, they will be addressed in detail in the discussion section.

DISCUSSION

Test run results, Site A

The output files for each test run include a concentration grid for each time increment. This grid shows the shape of the plume and the contaminant concentrations at each node or cell in the grid. Remember, the objective is to vary certain aquifer parameters and look at the effects on migration. An excellent way to do this is to compare the concentration grids for each test run at the end of 1 year, 3 years, and 5 years.

In figure 25, each concentration grid is color coded, depending on the degree of contamination to facilitate comparing contamination distributions. Every 8 mg/L change in

concentration is represented by a different color.

COLOR CHART
For Plume Shape and Concentration

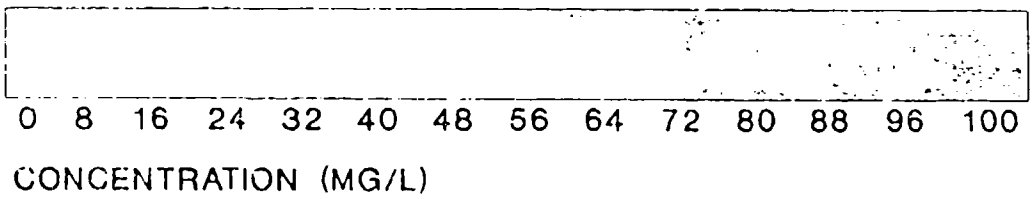


FIGURE 25 Color chart for plume shape and concentration.

Figure 26 shows the concentration grids for the "standard" test run. This will be the basis for comparison with the other model results. Figure 24 may be referred to for the location of Site A and the Vinland wells on the grid. Looking at figure 26, the highest contaminant concentration remains at Site A. The direction of flow of the plume shows the effect, or pull, of the Vinland wells. However, even with the effect of the wells, the plume is still moving down-gradient, toward the constant-head boundary representing the Hood Canal, at the bottom of the grid. Over time, the general shape of the plume does not change, but the higher concentrations in the center of the plume do spread to cover a larger area. For this run, there is only 1 withdrawal well showing any contamination.

Figure 27 shows the concentration grids after increasing the dispersion ratio from 0.3 to 0.9. Notice that there is little

difference between this grid and the standard run, in that the plume shapes are very similar. However, the contaminant concentrations in the center of the plume are lower for this run. In addition, the concentrations to the right of Site A, away from the wells, are slightly elevated. This is expected because with a higher dispersion ratio, the plume would tend to spread more while heading down-gradient. But overall, even with these small differences, it appears that dispersion ratio is not a major controlling factor on the degree of migration in this case. As with the standard run, there is only 1 withdrawal well with any contamination.

CONCENTRATION

TIME: 1 YEAR

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	3	0	0	0
0	0	2	2	4	30	93	3	0	0
0	0	6	26	53	84	87	25	1	0
0	0	7	68	81	82	65	10	1	0
0	0	7	37	82	84	51	12	1	0
0	0	2	24	71	73	39	8	1	0
0	0	[illegible]	3	67	63	16	7	1	0
0	0	0	0	0	0	0	0	0	0

TIME: 3 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	3	30	95	3	0	0
0	0	15	32	47	90	93	14	0	0
0	0	62	76	84	89	88	9	1	0
0	0	60	84	86	84	51	7	1	0
0	0	39	80	82	78	14	6	1	0
0	0	4	47	80	73	23	7	2	0
0	0	0	0	0	0	0	0	0	0

TIME: 5 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	29	95	3	0	0
0	0	12	23	52	90	93	14	0	0
0	0	67	80	86	90	88	9	1	0
0	0	70	83	85	84	52	7	1	0
0	0	55	82	80	81	15	7	1	0
0	0	15	68	78	75	18	7	1	0
0	0	0	0	0	0	0	0	0	0

□ SITE A
◯ WITHDRAWAL WELLS

SITE A TEST No. 1 - 5 WITHDRAWAL WELLS, DISPERSION RATIO 0.3, TRANSMISSIVITY 0.14, AQUIFER THICKNESS 25 FEET, WATER TABLE HEIGHT 50 FEET, RUN TIME 5 YEARS.

FIGURE 26 Concentration fields for test run 1 (Standard).

CONCENTRATION

TIME: 1 YEAR

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	3	4	1	0	0
0	0	3	4	8	30	88	7	1	0
0	0	8	25	50	76	80	30	2	0
0	0	13	59	70	72	63	17	4	0
0	0	9	41	71	73	50	21	5	0
0	0	3	23	60	62	43	16	6	0
0	0	0	4	53	52	28	16	7	0
0	0	0	0	0	0	0	0	0	0

TIME: 3 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	3	3	1	0	0
0	0	4	4	7	31	89	7	1	0
0	0	13	30	46	81	85	21	2	0
0	0	54	64	72	78	76	18	4	0
0	0	51	70	72	71	49	15	5	0
0	0	35	66	70	66	25	15	6	0
0	0	4	43	65	62	32	15	7	0
0	0	0	0	0	0	0	0	0	0

TIME: 5 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	2	3	1	0	0
0	0	5	4	8	30	90	7	1	0
0	0	12	23	50	81	85	21	2	0
0	0	57	66	72	78	77	19	4	0
0	0	59	70	71	71	51	16	5	0
0	0	46	69	65	67	27	16	6	0
0	0	14	59	64	63	29	16	7	0
0	0	0	0	0	0	0	0	0	0

□ SITE A
○ WITHDRAWAL WELLS

SITE A TEST NO. 2 - 5 WITHDRAWAL WELLS, DISPERSION RATIO 0.9, TRANSMISSIVITY 0.14, AQUIFER THICKNESS 25 FEET, WATER TABLE HEIGHT 50 FEET, RUN TIME 5 YEARS.

FIGURE 27 Concentration grids for test run 2 (Dispersion Ratio).

Figure 28 shows the concentration grids after increasing the aquifer thickness from 25 feet to 45 feet. Again, there are no significant differences between these grids and the standard run. In this grid, the contaminant concentrations in the center of the plume are only slightly lower, but the shape is very close to the standard. This is not surprising, since a change in aquifer thickness would effect migration in the vertical direction more than it would effect the plume shape. Unfortunately, USGS-MOC does not have the ability to show migration in the vertical direction. In the end, it appears that aquifer thickness, like dispersion ratio, is not a controlling factor on migration.

Figure 29 shows the results of changing the water table height from 50 feet to 135 feet. Unlike prior test runs, these grids are much different than the standard run grids. The highest contaminant concentrations are no longer limited to Site A. In fact, concentrations of over 96 mg/L appear in one-third of the plume for all 3 time increments. Remember, the maximum initial concentration was only 100 mg/L. In addition, because of the large change in gradient (from 135 feet to 0 over the grid area), the Vinland wells appear to have only a minor effect on the plume shape. The concentrations on the left side of the plume (brown in color) are slightly higher than the concentrations on the right side (maroon in color), showing a slight pull toward the wells.

CONCENTRATION

TIME: 1 YEAR

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	37	95	3	0	0
0	0	4	33	36	90	94	7	0	0
0	0	4	64	83	90	88	9	1	0
0	0	1	19	28	80	51	8	1	0
0	0	0	2	44	69	13	7	1	0
0	0	0	0	16	28	10	4	1	0
0	0	0	0	0	0	0	0	0	0

TIME: 3 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	28	95	3	0	0
0	0	7	31	47	90	93	13	0	0
0	0	17	79	86	90	88	9	1	0
0	0	33	77	82	84	51	7	1	0
0	0	6	70	78	81	15	7	1	0
0	0	1	22	78	76	18	7	1	0
0	0	0	0	0	0	0	0	0	0

TIME: 5 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	2	1	0	0
0	0	3	2	4	30	95	15	0	0
0	0	14	25	52	88	92	7	0	0
0	0	55	77	80	82	76	7	1	0
0	0	52	83	87	87	39	9	1	0
0	0	38	79	82	75	44	6	1	0
0	0	4	46	79	71	23	8	1	0
0	0	0	0	0	0	0	0	0	0

□ SITE A
○ WITHDRAWAL WELLS

SITE A TEST NO. 3 - 5 WITHDRAWAL WELLS, DISPERSION RATIO 0.3, TRANSMISSIVITY 0.14, AQUIFER THICKNESS 45 FEET, WATER TABLE HEIGHT 50 FEET, RUN TIME 5 YEARS.

FIGURE 28 Concentration grids for test run 3 (Aquifer Thickness).

CONCENTRATION

TIME: 1 YEAR

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	1	2	0	0
0	0	0	0	5	47	23	34	2	0
0	0	1	7	50	86	99	76	6	0
0	0	3	47	84	98	99	88	14	0
0	0	5	88	96	99	98	85	21	0
0	0	8	93	98	99	97	85	22	0
0	0	12	91	98	99	97	81	25	0
0	0	14	89	98	99	96	81	23	0
0	0	0	0	0	0	0	0	0	0

TIME: 3 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	2	2	0	0
0	0	0	0	5	42	81	33	2	0
0	0	1	7	53	84	99	71	7	0
0	0	3	46	81	98	99	89	18	0
0	0	5	89	96	99	98	85	25	0
0	0	8	93	98	99	97	83	21	0
0	0	12	91	98	99	97	82	23	0
0	0	14	89	98	98	96	80	27	0
0	0	0	0	0	0	0	0	0	0

TIME: 5 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	2	2	0	0
0	0	0	0	4	39	80	31	2	0
0	0	1	7	54	87	99	73	6	0
0	0	3	39	83	98	99	86	18	0
0	0	5	89	96	98	98	83	20	0
0	0	8	93	98	99	97	83	21	0
0	0	12	91	98	99	97	82	24	0
0	0	14	89	98	99	96	80	27	0
0	0	0	0	0	0	0	0	0	0

□ SITE A
○ WITHDRAWAL WELLS

SITE A TEST NO. 4 - 5 WITHDRAWAL WELLS, DISPERSION RATIO 0.3, TRANSMISSIVITY 0.14, AQUIFER THICKNESS 25 FEET, WATER TABLE HEIGHT 135 FEET, RUN TIME 5 YEARS.

FIGURE 29 Concentration grids for test run 4 (Water Table)

The overall results of this test run show that the plume is more highly concentrated and much larger than the standard. Therefore, the migration potential appears to increase noticeably with an increase in water table height or aquifer gradient.

The concentration grids for the final test run are shown in figure 30. In these grids, the transmissivity was changed from 0.14 to 0.04. Decreasing this parameter seems to have the opposite effect of increasing the gradient. Like other test runs, the highest contaminant concentration appears at the site. But in this case, the plume appears to be moving in two different directions. On the left side, the effect of the Vinland wells is obvious. In fact, the pull of the wells seems to be the strongest influence on the plume shape. This is expected with such a low transmissivity. However, on the right side of the plume, away from the wells, the gradient has the strongest influence on contaminant migration. Although the concentrations are low, averaging 4 mg/L, the plume is still moving down-gradient, toward the Hood Canal.

As a final note for this run, although the dispersion ratio is unchanged, the plume is more wide-spread than the standard run, particularly up-gradient of the site. Reasons for this are unknown. Perhaps it is the result of a slow migration rate, in that with slower migration, the contaminant may have a better chance of dispersing in more directions, than with a higher flow rate.

CONCENTRATION

TIME: 1 YEAR

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	2	1	0	0
0	0	1	1	10	51	66	13	0	0
0	0	7	21	60	84	92	41	2	0
0	0	2	42	89	93	93	38	3	0
0	0	0	6	48	67	62	7	3	0
0	0	0	0	2	5	7	3	2	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

TIME: 3 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	3	1	0	0
0	0	1	0	10	51	73	11	0	0
0	0	7	22	66	85	98	40	2	0
0	0	1	44	87	95	94	40	3	0
0	0	0	8	41	59	58	10	4	0
0	0	0	0	4	10	8	5	4	0
0	0	0	0	0	0	0	3	3	0
0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0

TIME: 5 YEARS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	3	1	0	0
0	0	0	0	13	45	70	16	0	0
0	0	7	21	61	86	97	39	2	0
0	0	2	50	87	94	93	37	3	0
0	0	0	6	41	60	52	10	4	0
0	0	0	1	2	9	8	5	4	0
0	0	0	0	0	1	0	3	3	0
0	0	0	0	0	0	0	3	1	0
0	0	0	0	0	0	0	0	0	0

□ SITE A
○ WITHDRAWAL WELLS

SITE A TEST NO. 5 - 5 WITHDRAWAL WELLS, DISPERSION RATIO 0.3, TRANSMISSIVITY 0.04, AQUIFER THICKNESS 25 FEET, WATER TABLE HEIGHT 50 FEET, RUN TIME 5 YEARS.

FIGURE 30 Concentration Grids for test run 5 (Transmissivity).

Results of selected observation points, Site A

After comparing all test runs, it is clear that water table height and transmissivity effect the migration of contaminants at Site A more than other parameters. However, before any specific conclusions are drawn, one more set of comparisons should be made. The model results for all runs should be compared at selected observation points. Please refer back to figure 24 for the specific location of the four observation points selected for these model runs.

Observation point one is located to the north of Site A, next to the Vinland area withdrawal wells. This location was chosen to look at the effects of the wells on migration, without the effects of a constant-head boundary. Figure 31 is a graph showing the change in concentrations at observation point one over the selected run time. The graph covers the five year period, because it is important to see not only the final concentration for each test run, but also the trend over the entire time.

MODELING SITE A

Comparing Results at Observation Point 1

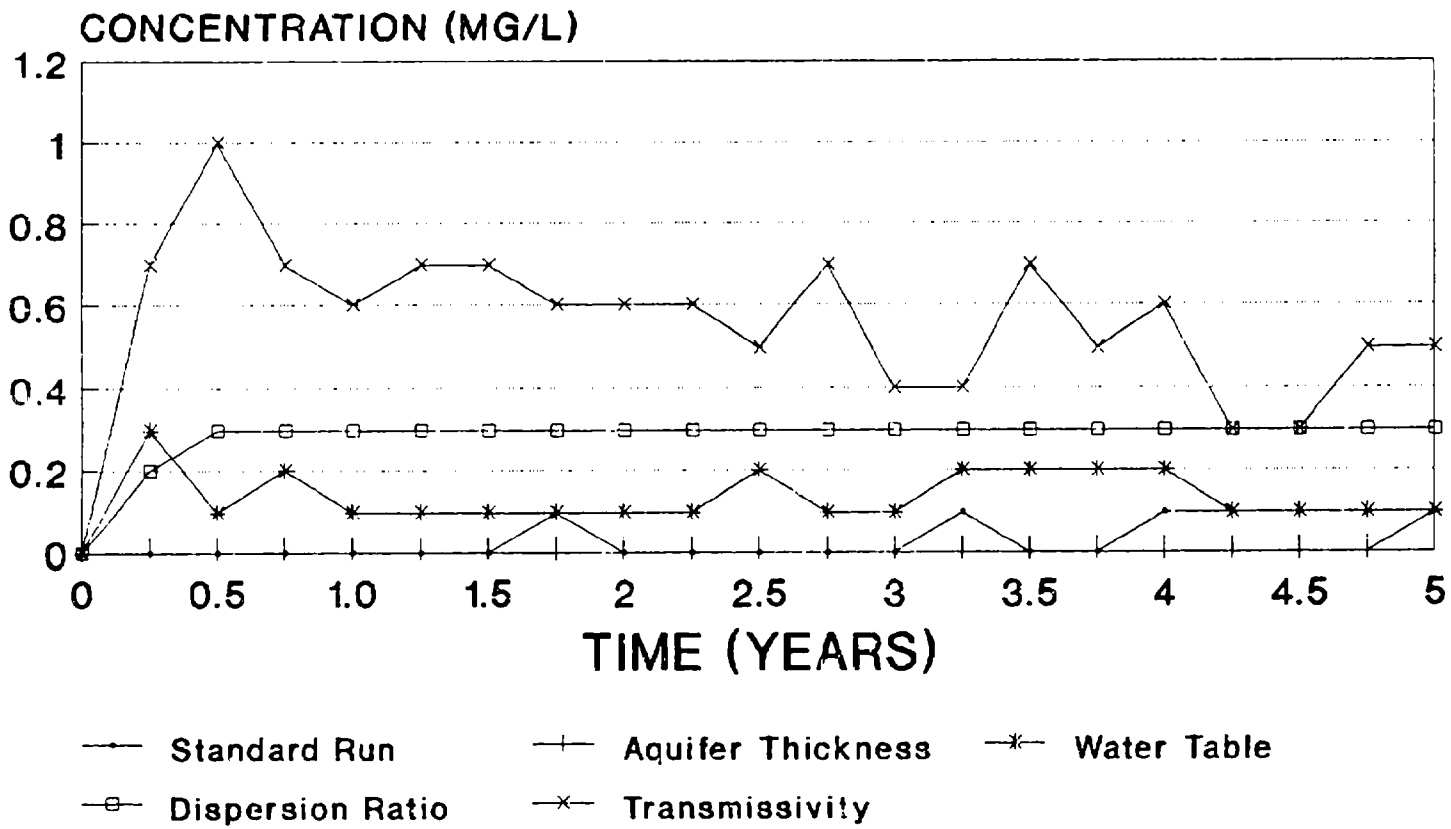


FIGURE 31 Observation Point One - Comparing results of all test runs over the entire pumping period.

For all test runs, concentrations remain low at this observation point, at less than 1 mg/L. However, while most concentration averages are below or equal to 0.3 mg/L, the concentration for the run in which transmissivity was varied averages twice that, or 0.6 mg/L. While this may not appear to be significant, due to the low overall levels, it does show that transmissivity is the controlling factor at observation point one, in that when transmissivity is decreased, the concentration increases. Referring back to figure 30, the concentration grids for test run number 5 show that with a lower transmissivity, the plume spreads or disperses laterally to the gradient instead of parallel to it. Knowing this, it is not surprising that the concentration would be higher at observation point one when the transmissivity is decreased.

Figure 32 shows the results at observation point two. This location was selected to look at the effects of the withdrawal wells combined with the effects of a constant-head boundary. Because this observation point is located down-gradient of Site A, this will also influence the results. The graph shows that the overall concentrations are much higher at this location than at observation point one. This is an expected effect of gradient on migration. During the 5 year time period, the concentrations of most test runs increased to roughly 60 mg/L after five years. However, two of the runs (transmissivity and water table height) increase for the first six months, then level off at 0.5 and 5 mg/L respectively.

MODELING SITE A

Comparing Results at Observation Point 2

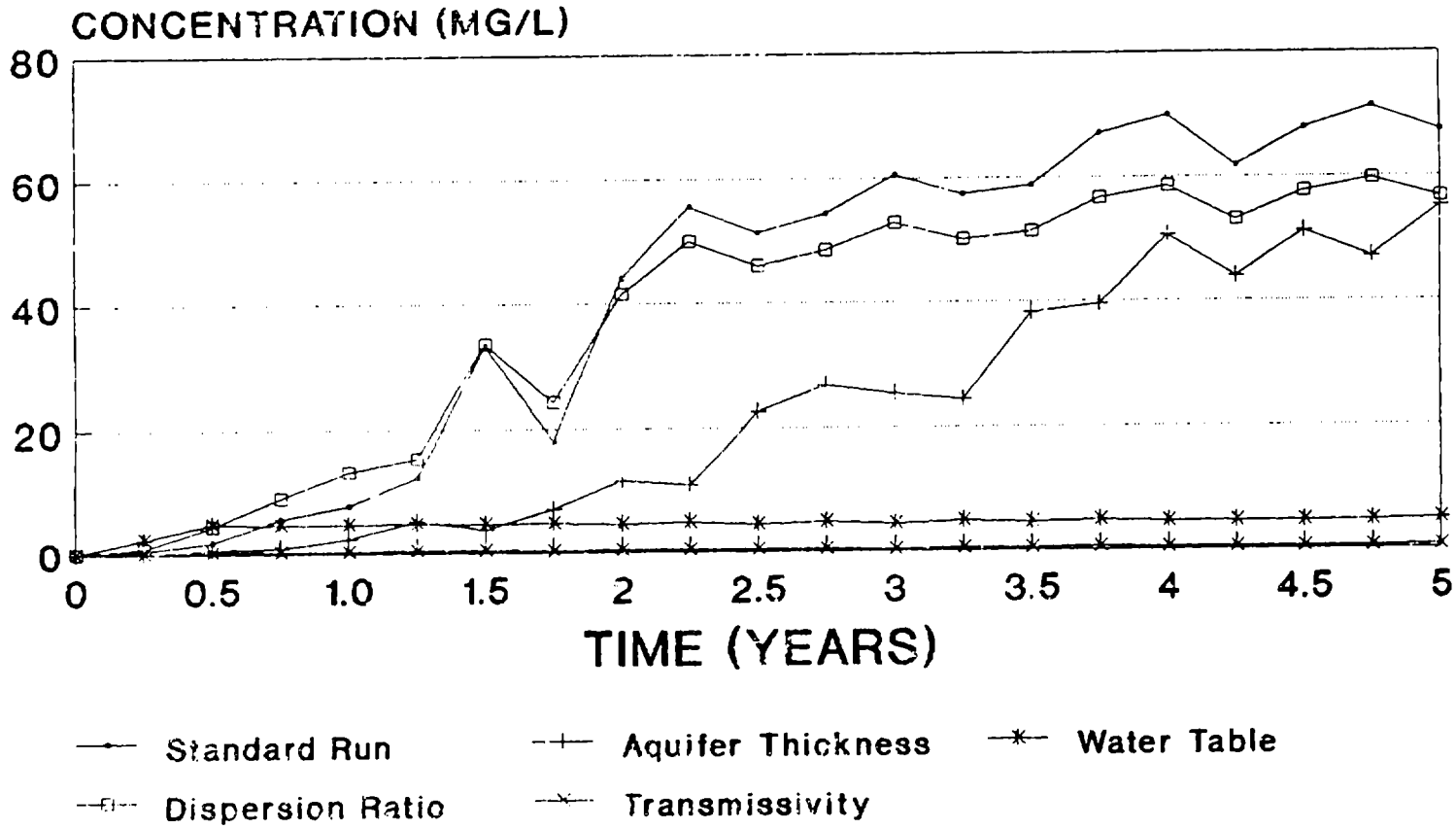


FIGURE 32 Observation Point Two - Comparing results of all test runs over the entire pumping period.

When the gradient or water table height is increased, the plume is pulled toward the Hood Canal (bottom of the grid). Because this observation point is located so far to the left of the site (2800 feet), it makes sense that concentrations for test run number 4 (water table height) would decrease with an increase in gradient. In fact, any increase in contaminant levels at all should be due mainly to diffusion. The same holds true for test run number 5 (transmissivity).

Observation Point three is located down-gradient from Site A, so that migration can be examined without the influence of the wells or constant-head boundaries. Figure 33 shows the results at this location. As shown, the highest concentrations occur when the water table height is increased. This is expected, and was shown earlier in the concentration grids for that test run (figure 29). During other test runs, concentrations increase during the first six months, as with observation point two, then level off at an average of 75 mg/L. However, the run in which transmissivity was decreased is an exception. Here, the concentration reached no more than 10 mg/L. Referring to the concentration grids for that test run, this is also an expected result. A low transmissivity would limit the amount of contaminant that would reach this observation point.

MODELING SITE A

Comparing Results at Observation Point 3

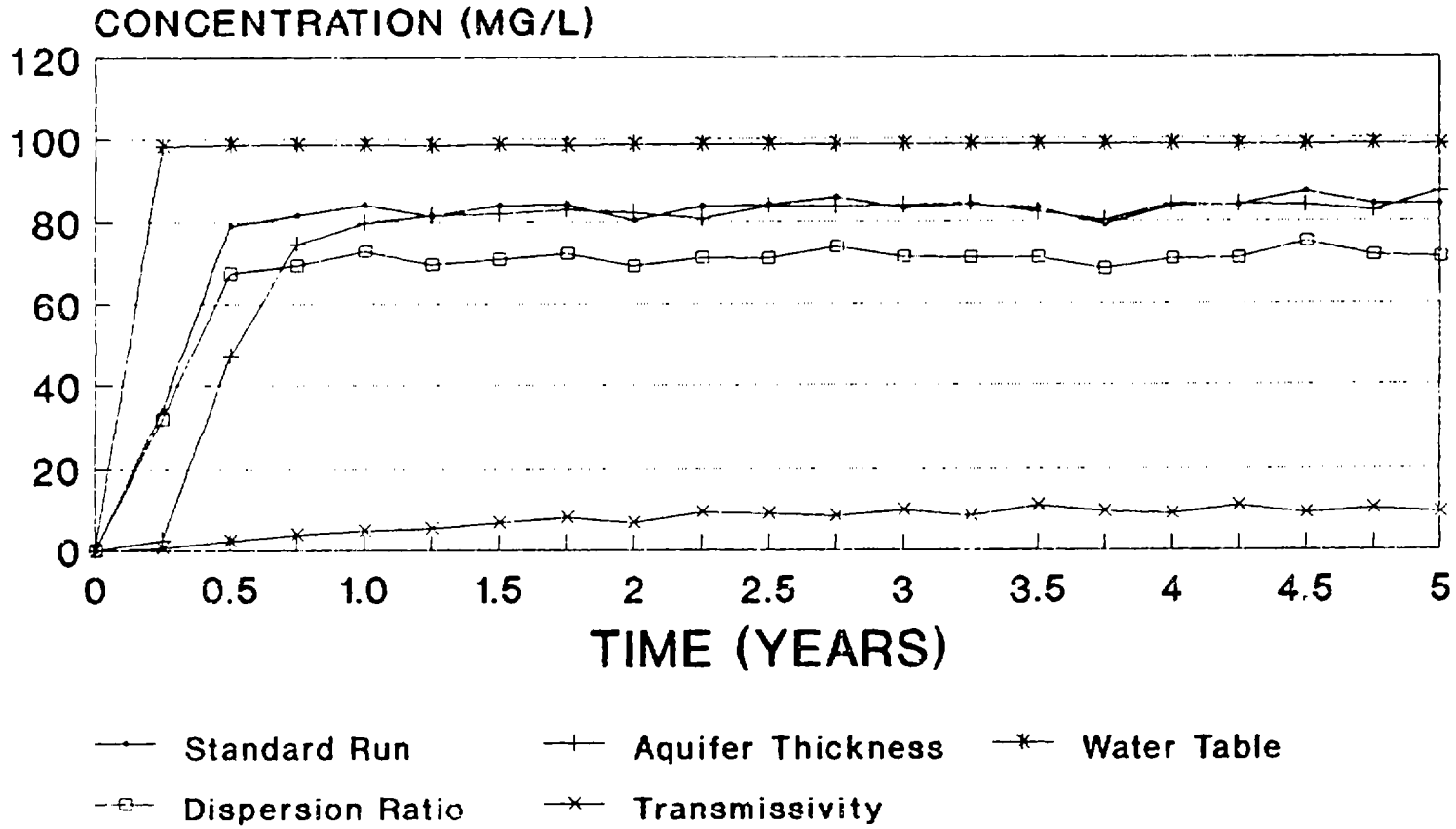


FIGURE 33 Observation Point Three - Comparing results of all test runs over the entire pumping period.

The final graph, figure 34, shows the results at observation point four. This point was chosen to illustrate the effects of a constant-head boundary, without the influence of the wells. As shown, the concentration reached in most runs is equal to or less than 5 mg/L. The exception here is the run in which the water table height was increased. Although the concentration levels off at the same time increment, after the first six months, it levels off at roughly 25 mg/L, or five times the concentration of the other runs. Since observation point four is located more down-gradient than any other point, a higher concentration would be expected here with an increase in water table height. This also corresponds to the concentration grids for test run number 4, shown in figure 29.

MODELING SITE A

Comparing Results at Observation Point 4

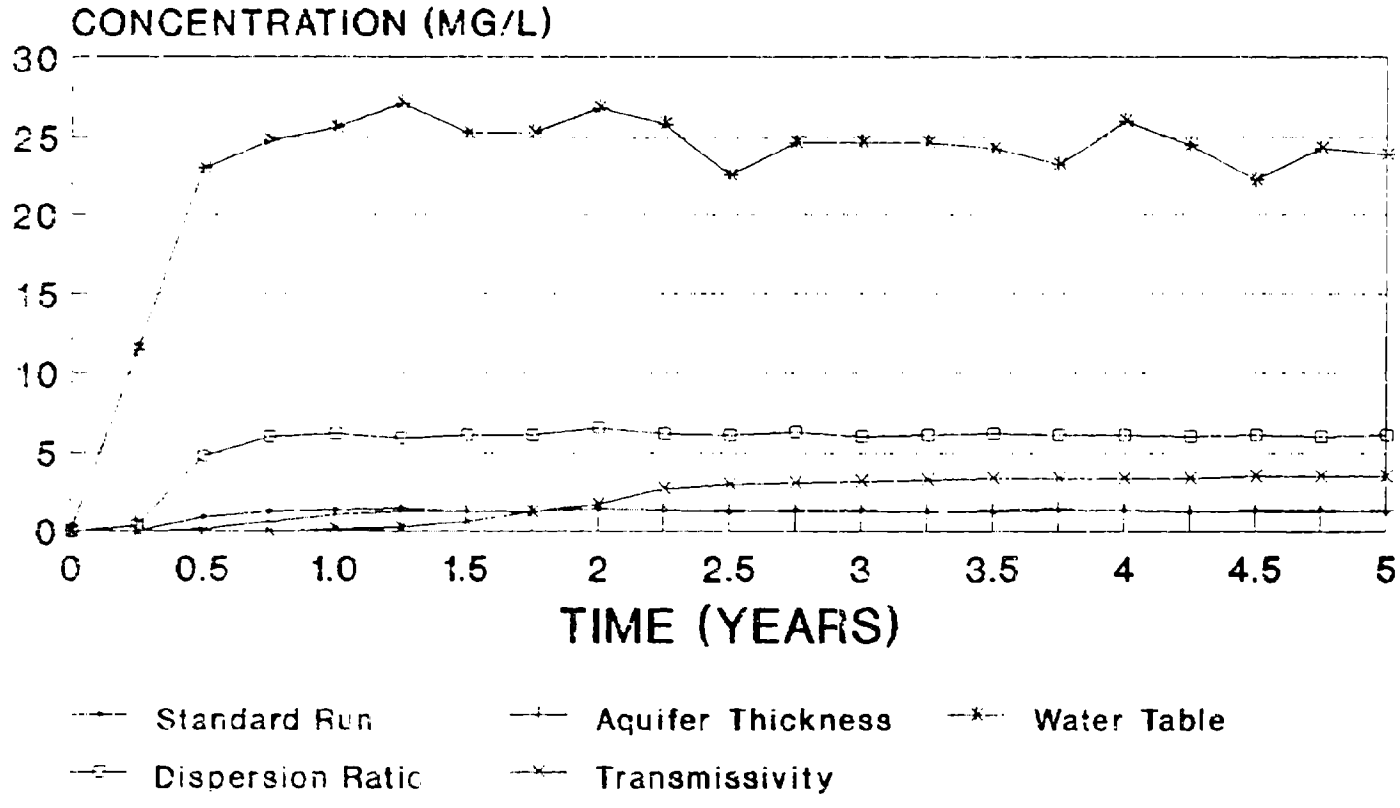


FIGURE 34 Observation Point Four - Comparing results of all test runs over the entire pumping period.

Summary of model results for Site A

After examining the output files for all test runs, transmissivity and water table height (or gradient) are found to be the two most sensitive factors controlling migration at Site A. A lower transmissivity caused a decrease in migration, with one exception. In the vicinity of the Vinland wells, the concentrations were slightly elevated when this parameter was decreased. But the overall levels were still under 1 mg/L. Because the wells are located at the same elevation as Site A, or only slightly lower, the effects of diffusion would result in the increased levels, particularly with a lower transmissivity.

On the other hand, when the water table height was increased, the migration also increased. The only exception is when both area wells and a constant-head boundary influence migration. However, this observation point was located at some distance from Site A, and at the same elevation as the site, so an increase in water table height would have little influence. Because of the large changes in concentration that occur when water table height is increased, it appears to have the strongest influence on migration from Site A, and should be examined in detail when evaluating the site.

The concentration grids for test runs 2 and 3 (dispersion ratio and aquifer thickness) were surprising in that varying these values did not effect the general shape and direction of the plume. In addition, at the four observation points, the concentrations for these runs were close to the contaminant

levels found in the standard run. Therefore, variations in the dispersion ratio or aquifer thickness will not strongly effect contaminant migration, if at all.

DISCUSSION

Model Applicability to Site A

Going through this groundwater model was valuable because it provided an easy way to vary different aquifer characteristics and see the effect on contaminant migration. However, if the objective had been to specifically simulate the actual migration from Site A and obtain true contaminant levels, additional information would be required.

First, precise soil and hydraulic data must be obtained. A range of possible values for any one parameter would not be acceptable input data. Secondly, the aquifer's true no-flow boundaries must be mapped for accurate model simulation. Finally, accurate initial pollutant concentrations at the site must be obtained and a time period must be chosen to project contaminant migration.

Unfortunately, even with all this additional information, the resulting concentrations would still be inaccurate because USGS-MOC does not take the possible chemical and physical reactions (i.e. adsorption, degradation) of each contaminant into account. However, if enough is known about the behavior of the specific pollutants, numerical relationships could be developed to account for these reactions and then applied to the model output.

If all the necessary adjustments were made to account for contaminant behavior, the resulting concentrations would be close to simulating the actual migration patterns. While using USGS-MOC alone may not provide accurate results, I believe it does provide a good first look at the potential pollutant migration from the site.

Fate of Contaminants

The only contaminant consistently detected in soil samples both on and adjacent to Site A was RDX. Because of this compound's low solubility and sorption coefficient, I believe that while the bulk of RDX disposed of at the site will remain in the soil media, this compound has the highest potential for migration in groundwater. Levels of RDX were found in surface and groundwater samples, although the concentrations were extremely low.

TNT was detected at high concentrations in the surface soil amples at the site, but other samples (surface and subsurface) show low levels, if any. Concentrations of TNT were also found in surface water samples, but at low levels as well. Although TNT was not detected in groundwater, I believe there is potential for this compound to migrate through both surface and groundwater due to its high solubility and low desorption coefficient.

Although the phthalates were detected in only a few soil samples (none were found in water samples), they were consistently detected in plant tissue at the site. Because of their high volatility and low solubility, I believe

bioaccumulation would be the only potential for migration from Site A, and even then it would be limited to the flora in the immediate area.

Zinc was detected in all soil samples at high concentrations, and also found at slight levels in surface water. Because zinc is insoluble, this compound will remain in the soil media with little chance for migration.

The RI Process

After going through the RI process, I have made the following observations. First, when examining a hazardous waste site, extreme care must be taken to ensure that the evaluation is as accurate as possible. To accomplish this, sampling must be detailed and the data analysis must be specific, which is more difficult than it appears. When most contaminants were disposed of at these sites, the words "hazardous waste" were practically non-existent. Therefore, very few, if any, records were kept regarding the waste materials and the quantities discarded, as is the case for Site A. This results in a lack of raw data, which in turn makes the evaluation less reliable, not only effecting the outcome of the RI, but also effecting the FS portion of the clean up process. Because the development of remediation alternatives depends on the data collected and analyzed, weaknesses in the evaluation of the site are carried over to the Feasibility Study.

Secondly, because extensive field sampling is expensive and time-consuming, computer modeling can be used to supplement

sampling and assist in developing a picture of the potential for contaminant migration. While modeling, itself, will not result in a complete site evaluation, it is an excellent way to vary the unknown parameters and examine the effects of these changes on contaminant migration. This approach can save valuable time by showing what the critical parameters are and where future efforts should be concentrated.

I believe the existing RI process is well-organized and adequate to carry out its purpose. However, the accuracy and completeness of the final RI is a function of the complexity of the site being evaluated. Obtaining an RI with a high degree of confidence requires expenditure of both time and money. Judgement must be used to find a balance between expenditure and the detail of accuracy of the final report, particularly with a more complex site.

CONCLUSIONS

The objective of this study was to gain experience on the RI process. Data from an actual hazardous waste site (Site A) was necessary to carry out this study. The effort involved obtaining information of the behavior of the contaminants and the hydrogeological and surface water characteristics at a hazardous waste site. A second goal was to gain experience with application of a groundwater flow computer model, USGS-MOC, to evaluate contaminant transport from Site A. The following conclusions and results from this study are summarized for Site A. First:

1. Contamination is present in soil, surface water, and groundwater, with the majority found in the soil media.

2. Contaminant concentrations in the soil adjacent to Site A are the result of dust movement and/the heavy traffic involved in opeations conducted at the site.

3. Contaminant migration in surface water is toward the stormwater discharge area; rates are unknown.

4. Contamination is present in groundwater, but rates of migration are unknown.

General conclusions for the entire exercise are:

1. Computer modeling can provide a way to vary unknown parameters and examine the effects on contaminant migration.

2. Although accurate concentrations cannot be obtained by using USGS-MOC, it does provide a good first look at contaminant migration.

3. To minimize the limitations of the existing RI process, field sampling and analysis should be coupled with computer modeling, when evaluating a hazardous waste site.

4. The existing RI process is well-organized, but problems with complexity of compounds makes it very costly and time-consuming to characterize a site with a high degree of confidence.

Works Cited

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APPENDIX 1

Chronology of Events involving Site A

CHRONOLOGY OF SITE A

1944	U.S. Naval Magazine Facility, Bangor is established as a transfer point for ordinance.
1958	Demilitarization of ordnance is added to Bangor's mission.
1962	March, Site A is established as an ammunition burning and detonation site.
1965-1967	An incinerator for small arms and dangerous pyrotechnic items, and a shielded blast pit for TNT detonation was added to Site A. In addition, several pits, trenches, and/barrel storage areas were added.
1966-1970	Demilitarization peaks due to Vietnam.
1971	500 cy of material with TNT and RDX was removed from Site F and burned with fuel oil and scrap lumber at Site A.
1975	Most activities at Site A ceased, as the result of concerns by the Navy and U.S.G.S.
1977	Demilitarizing operation buildings were demolished and burned at Site A.
1978	The Navy begins Assessment and Control of Installation Pollutants (ACIP) program to evaluate waste disposal sites at SUBASE, including Site A.
1978-1979	Revegetation of Site A.
1977	Navy convenes a combined local task force to identify sites as sources of potential pollution.
1977-1986	Limited testing of materials is conducted two to three times a year at Site A. 340 soil samples are collected from Site A, most samples are taken within a depth of 4 feet.
1978-1984	261 water samples are collected from Site A and vicinity by SUBASE personnel.
1980	Cessation of on-site excavations at Site A.
1980	September, Navy initiates (NACIP) in response to CERCLA.
1980-1988	286 water quality samples have been collected at Site A and the vicinity.

1981	Initial Assessment Study (IAS) is conducted on Site A as part of NACIP.
1983	Navy constructs a diversion structure to route local surface flows to the stormwater discharge area, where water infiltrates the ground before discharge to the Hood Canal.
1984	Navy contracts to develop a POA and conduct verification and characterization studies of 11 sites, including Site A.
1984-1985	Samples of clams and oysters on Hood Canal are analyzed for TNT, RDX, otto fuel, and/picric acid, no detectable levels of TNT or RDX are found.
1985	The report is issued by the contractors.
1986	The characterization study, conducted under NACIP is conducted.
1986	Congress enacts SARA, so the Navy suspends further NACIP activity and phases in RI/FS programs.
1987	EPA adds Site A to the NPL list and RI/FS scoping is initiated.
1988	April, A current situation report is completed analyzing existing information, identifying information and data gaps, and evaluating interim remedial measures (IRM).
1991	Official RI/FS completed. The results have not been made available to the author.

APPENDIX 2

Sample Input Data File for Computer Model USGS-MOC

```
TITLE:  SITE  A  TEST  NO.  1  (5  WELLS,  DISPERSION  RATIO  0.3,
TRANSMISSIVITY 0.14, AQUIFER THICKNESS 25, WATER TABLE 50)
   1   1   9  113200   1   7   5 100   5   9   2  10   0   0   1
0
    5.0001 0.25 100.   0.   0.   0. 800. 800.  0.3 0.50   1.

 5 5
 5 6
 6 6
 7 6
 5 8
 3 3   0.01
 2 4   10.0
 2 5   0.01
 3 6   10.0
 2 6   0.01
0 0.14
0 25.0
0 0.0
1 1.0
000000000
022222220
000000000
000001000
000001000
000000000
000000000
000000000
000000000
022222220
000000000
 2        1.0        0.0        0.0 0
 1        1.0      100.0        0.0 0
1 1.0
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.  80.  80.  80.  80.  80.  80.  80.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.   0.   0.   0.   0.  55.   0.   0.   0.
  0.   0.   0.   0.   0.  50.   0.   0.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.   0.   0.   0.   0.   0.   0.   0.   0.
0 0.0
```

CARD NO. 1

TITLE: SITE A TEST NO. 5 (5 WELLS, DISPERSION RATIO 0.3, TRANSMISSIVITY 0.14, AQUIFER THICKNESS 25, WATER TABLE 50)	Title and description of the problem to be modeled.

CARD NO. 2

1	Maximum number of time steps in the pumping period.
1	Number of pumping periods.
9	Number of nodes in the X direction.
11	Number of nodes in the Y direction.
3200	Maximum number of available particles, maximum is 3200.
1	Number of time steps between printouts of hydraulic and chemical output data.
7	Number of iteration parameters, must be between 4 and 7, usually set at 7.
4	Number of observation points in the problem, to be defined in data set 1.
100	Maximum permitted number of iterations.
5	Number of withdrawal or injection wells in the problem, to be defined in data set 2.
9	Initial number of particles per node, 9 is used for uniformity.
2	Number of node identification codes required, to be defined in data set 6.
10	Particle movement interval for printing chemical output data.
0	Option for printing computed velocity, 0 = do not print.
0	Option for printing computed dispersion equation coefficients, 0 = do not print.
1	Option for printing computed changes in concentration, 1 = print
0	Option for printing punch velocity data, 0 = do not

print.

CARD NO. 3

5	Pumping period in years when running problem
.0001	Convergence criteria.
.25	Effective porosity of soil.
100	Longitudinal dispersivity of porous medium.
0	Storage coefficient, set equal to 0 for steady flow.
0	Time increment multiplier for transient flow problems, equal to 0 if steady state.
0	Size of initial time step in seconds, equal to 0 if steady state.
800	Width of each finite difference cell in the X direction.
800	Width of each finite difference cell in the Y direction.
0.3	Dispersivity ratio, transverse to longitudinal dispersivity.
0.50	Maximum cell distance per particle move, usually set equal to 0.5, limit is 1.
1	Anisotropy factor.

DATA SET NO. 1

3 4 2 7 5 8 8 9	X and Y coordinates of the observation points.

DATA SET NO. 2

3 3	0.01	
2 4	10.0	X and Y coordinates of the withdrawal or injection wells. In this case, since all wells are withdrawal, the next number is the rate of pumping, in cf/sec.
2 5	0.01	
3 6	10.0	
2 6	0.01	

DATA SET NO. 3

0 0.14 Parameter card for transmissivity. If assumed

homogeneous throughout the problem grid, it is set equal to 0, with the transmissivity following.

DATA SET NO. 4

0 25.0 Parameter card for aquifer thickness, assumed to be homogeneous.

DATA SET NO. 5

0 0.0 Parameter card for aquifer recharge/discharge.

DATA SET NO. 6

1 1.0 Parameter card for node identification codes.

```
000000000
022222220
000000000
000001000
000001000
000000000
000000000
000000000
000000000
022222220
000000000
```

Node identification matrix for the problem grid. The number 2 shows the location of the constant head boundaries. The number 1 shows the location of the source, or Site A.

DATA SET NO. 7

2 Node identification instructions. This number is the node identification code used in the matrix in data set no. 6.

1.0 Multiplication factors if needed.

0.0 Initial concentration of contaminant in source or constant head boundaries.

0.0 Recharge values if needed.

0 Override values if needed. This is used to preserve the values for recharge set in data set no. 5. It is equal to 0 if there is no recharge.

1
1.0
100.0
0.0
0

These are the same as defined above. Initial concentration is set to 100.0 here since these figures represent Site A.

DATA SET NO. 8

1 1.0 Parameter card for water table elevations.

0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	80.	80.	80.	80.	80.	80.	80.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	55.	0.	0.	0.
0.	0.	0.	0.	0.	50.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.

Water table elevation matrix. Values must be set for all constant head boundaries and source of contamination. The bottom constant head boundary is set to 0 in this case because it represents the Hood Canal.

DATA SET NO. 9

0 0.0 Parameter card for initial concentration in the aquifer. It is set equal to 0 since the only source of contamination is from Site A.

APPENDIX 3

Sample Output File for Computer Model USGS-MOC

U.S.G.S. METHOD-OF-CHARACTERISTICS MODEL FOR SOLUTE TRANSPORT IN GROUND WATER

THIS VERSION IS DISTRIBUTED BY INTERNATIONAL GROUND WATER MODELING CENTER
HOLCOMB RESEARCH INSTITUTE, BUTLER UNIV., INDIANAPOLIS, IN 46208, USA

TITLE: SITE A TEST NO. 1 (5 WELLS, DISPERSION RATIO 0.3, TRANSMISSIVITY 0.14, AQUIFER THICKNESS 25, WATER TABLE 50)

I N P U T D A T A

GRID DESCRIPTORS

```
NX    (NUMBER OF COLUMNS)  =     9
NY    (NUMBER OF ROWS)     =    11
XDEL  (X-DISTANCE IN FEET) =   800.0
YDEL  (Y-DISTANCE IN FEET) =   800.0
```

TIME PARAMETERS

```
NTIM   (MAX. NO. OF TIME STEPS)        =      1
NPMP   (NO. OF PUMPING PERIODS)        =      1
PINT   (PUMPING PERIOD IN YEARS)       =      5.000
TIMX   (TIME INCREMENT MULTIPLIER)     =       .00
TINIT  (INITIAL TIME STEP IN SEC.)     =      0.
```

HYDROLOGIC AND CHEMICAL PARAMETERS

```
S       (STORAGE COEFFICIENT)        =       .000000
POROS   (EFFECTIVE POROSITY)         =       .25
BETA    (CHARACTERISTIC LENGTH)      =    100.0
DLTRAT  (RATIO OF TRANSVERSE TO
        LONGITUDINAL DISPERSIVITY)   =       .30
ANFCTR  (RATIO OF T-YY TO T-XX)      =      1.000000
```

EXECUTION PARAMETERS

```
NITP   (NO. OF ITERATION PARAMETERS) =    7
TOL    (CONVERGENCE CRITERIA - ADIP) =     .0001
ITMAX  (MAX.NO.OF ITERATIONS - ADIP) =  100
CELDIS (MAX.CELL DISTANCE PER MOVE
           OF PARTICLES - M.O.C.)    =     .500
NPMAX  (MAX. NO. OF PARTICLES)       = 3200
NPTPND (NO. PARTICLES PER NODE)      =     9
```

PROGRAM OPTIONS

```
NPNT   (TIME STEP INTERVAL FOR
        COMPLETE PRINTOUT)        =     1
NPNTMV (MOVE INTERVAL FOR CHEM.
        CONCENTRATION PRINTOUT)   =    10
NPNTVL (PRINT OPTION-VELOCITY
```

```
                 0=NO; 1=FIRST TIME STEP;
                 2=ALL TIME STEPS)          =     0
         NPNTD  (PRINT OPTION-DISP.COEF.
                 0=NO; 1=FIRST TIME STEP;
                 2=ALL TIME STEPS)          =     0
         NUMOBS (NO. OF OBSERVATION WELLS
                 FOR HYDROGRAPH PRINTOUT)   =     4
         NREC   (NO. OF PUMPING WELLS)      =     5
         NCODES (FOR NODE IDENT.)           =     2
         NPNCHV (PUNCH VELOCITIES)          =     0
         NPDELC (PRINT OPT.-CONC. CHANGE)   =     1

           STEADY-STATE FLOW

     TIME INTERVAL (IN SEC) FOR SOLUTE-TRANSPORT SIMULATION =
.15779E+09
          LOCATION OF OBSERVATION WELLS
              NO.     X     Y

               1      3     4
               2      2     7
               3      5     8
               4      8     9

         LOCATION   OF   PUMPING   WELLS
          X   Y   RATE(IN CFS)   CONC.

          3   3       .0100        .00
          2   4     10.0000        .00
          2   5       .0100        .00
          3   6     10.0000        .00
          2   6       .0100        .00
          AREA OF ONE CELL =    .6400E+06
          X-Y SPACING:
              800.00
              800.00
 TRANSMISSIVITY MAP (FT*FT/SEC)
     .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
 .00E+00    .00E+00    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
 1.40E-01  1.40E-01    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
 1.40E-01  1.40E-01    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
 1.40E-01  1.40E-01    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
 1.40E-01  1.40E-01    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
 1.40E-01  1.40E-01    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
 1.40E-01  1.40E-01    .00E+00
     .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
```

```
1.40E-01  1.40E-01   .00E+00
    .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
1.40E-01  1.40E-01   .00E+00
    .00E+00   1.40E-01   1.40E-01   1.40E-01   1.40E-01   1.40E-01
1.40E-01  1.40E-01   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
 AQUIFER THICKNESS (FT)
      .0   .0   .0   .0   .0   .0   .0   .0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0 25.0 25.0 25.0 25.0 25.0 25.0 25.0   .0
      .0   .0   .0   .0   .0   .0   .0   .0   .0
 DIFFUSE RECHARGE AND DISCHARGE (FT/SEC)
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
 PERMEABILTY MAP (FT/SEC)
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00   .00E+00   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
```

```
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00   5.60E-03   5.60E-03   5.60E-03   5.60E-03   5.60E-03
5.60E-03  5.60E-03   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
 .00E+00   .00E+00   .00E+00

          NO. OF FINITE-DIFFERENCE CELLS IN AQUIFER =   63

          AREA OF AQUIFER IN MODEL  =   .40320E+08   SQ. FT.

          NZCRIT   (MAX. NO. OF CELLS THAT CAN BE VOID OF
                    PARTICLES;    IF  EXCEEDED,  PARTICLES   ARE
REGENERATED)   =    1

 NODE IDENTIFICATION MAP

     0    0    0    0    0    0    0    0    0
     0    2    2    2    2    2    2    2    0
     0    0    0    0    0    0    0    0    0
     0    0    0    0    0    1    0    0    0
     0    0    0    0    0    1    0    0    0
     0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0
     0    2    2    2    2    2    2    2    0
     0    0    0    0    0    0    0    0    0
      NO. OF NODE IDENT. CODES SPECIFIED =  2
           THE FOLLOWING ASSIGNMENTS HAVE BEEN MADE:
     CODE NO.      LEAKANCE      SOURCE CONC.     RECHARGE
         2          .100E+01           .00
         1          .100E+01         100.00
 VERTICAL PERMEABILITY/THICKNESS  (FT/(FT*SEC))
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
 .00E+00   .00E+00   .00E+00
    .00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00
1.00E+00  1.00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
 .00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00   1.00E+00
 .00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00   1.00E+00
 .00E+00   .00E+00   .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
```

```
.00E+00    .00E+00    .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00    .00E+00    .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00    .00E+00    .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00    .00E+00    .00E+00
    .00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00
1.00E+00  1.00E+00    .00E+00
    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00    .00E+00
.00E+00    .00E+00    .00E+00
 WATER TABLE
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.   80.   80.   80.   80.   80.   80.   80.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.    0.    0.    0.    0.   55.    0.    0.    0.
    0.    0.    0.    0.    0.   50.    0.    0.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
    0.    0.    0.    0.    0.    0.    0.    0.    0.
 CONCENTRATION

 NUMBER OF TIME STEPS =      0
        TIME(SECONDS) =    .00000
   CHEM.TIME(SECONDS) =    .00000E+00
   CHEM.TIME(DAYS)    =    .00000E+00
        TIME(YEARS)   =    .00000E+00
   CHEM.TIME(YEARS)   =    .00000E+00
  NO. MOVES COMPLETED =      0

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0
 HEAD DISTRIBUTION - ROW
 NUMBER OF TIME STEPS =      1
        TIME(SECONDS) =    .15779E+09
        TIME(DAYS)    =    .18263E+04
        TIME(YEARS)   =    .50000E+01

0    0    0    0    0    0    0    0    0    0
```

```
0    0   80   80   80   80   80   80   80    0
0    0   43   51   58   63   67   68   68    0
0    0   -1   24   38   48   55   57   57    0
0    0    0    7   22   36   50   47   46    0
0    0   -6  -16    9   23   32   35   35    0
0    0   -3   -3    6   15   21   24   25    0
0    0   -1    0    4    9   13   15   16    0
0    0    0    0    2    4    6    7    8    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
 DRAWDOWN
        0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0
        0   -42   -50   -57   -62   -66   -67   -67     0
        0     2   -23   -37   -47     0   -56   -56     0
        0     1    -6   -21   -35     0   -46   -45     0
        0     7    17    -8   -22   -31   -34   -34     0
        0     4     4    -5   -14   -20   -23   -24     0
        0     2     0    -3    -8   -12   -14   -15     0
        0     0     0    -1    -3    -5    -6    -7     0
        0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0
   CUMULATIVE MASS BALANCE -- (IN FT**3)


    RECHARGE AND INJECTION       =   .00000E+00
    PUMPAGE AND E-T WITHDRAWAL =   .31605E+10
    CUMULATIVE  NET  PUMPAGE     =   .31605E+10
    WATER RELEASE FROM STORAGE =   .00000E+00
    LEAKAGE INTO AQUIFER         =   .38022E+10
    LEAKAGE OUT OF AQUIFER       =  -.64172E+09
    CUMULATIVE  NET  LEAKAGE     =   .31605E+10
        MASS BALANCE RESIDUAL    =   5888.0
        ERROR  (AS PERCENT)      =   .15486E-03

   RATE MASS BALANCE -- (IN C.F.S.)
     LEAKAGE INTO AQUIFER        =   .24097E+02
    LEAKAGE OUT OF AQUIFER       =  -.40670E+01
    NET LEAKAGE     (QNET)       =   .20030E+02
    RECHARGE AND INJECTION       =   .00000E+00
    PUMPAGE AND E-T WITHDRAWAL =   .20030E+02
    NET WITHDRAWAL    (TPUM)     =   .20030E+02
 CONCENTRATION

 NUMBER OF TIME STEPS =     1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .31812E+07
   CHEM.TIME(DAYS)    =   .36820E+02
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .10081E+00
  NO. MOVES COMPLETED =    10
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	0	0	1	33	78	2	0	0
0	0	0	2	11	61	74	11	0	0
0	0	0	0	2	11	15	1	0	0
0	0	0	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .31812E+07
  CHEM.TIME(DAYS)    =   .36820E+02
        TIME(YEARS)  =   .50000E+01
  CHEM.TIME(YEARS)   =   .10081E+00
 NO. MOVES COMPLETED =    10
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	0	0	0	33	78	1	0	0
0	0	0	1	11	60	74	10	0	0
0	0	0	0	1	11	14	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .63624E+07
  CHEM.TIME(DAYS)    =   .73639E+02
        TIME(YEARS)  =   .50000E+01
  CHEM.TIME(YEARS)   =   .20161E+00
 NO. MOVES COMPLETED =    20
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	0	0	3	33	94	3	0	0
0	0	1	16	36	85	90	5	0	0

0	0	0	12	49	71	71	4	0	0
0	0	0	1	3	7	21	1	0	0
0	0	0	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .63624E+07
  CHEM.TIME(DAYS)    =   .73639E+02
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .20161E+00
 NO. MOVES COMPLETED =     20
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	0	0	2	33	94	2	0	0
0	0	0	15	36	85	90	5	0	0
0	0	0	11	49	70	70	3	0	0
0	0	0	0	3	6	21	0	0	0
0	0	0	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .95436E+07
  CHEM.TIME(DAYS)    =   .11046E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .30242E+00
 NO. MOVES COMPLETED =     30
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	1	1	3	37	95	3	0	0
0	0	2	27	35	89	93	16	0	0
0	0	1	26	70	84	73	8	1	0
0	0	0	2	10	51	44	4	1	0
0	0	0	0	2	6	4	1	0	0
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .95436E+07
  CHEM.TIME(DAYS)    =   .11046E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .30242E+00
 NO. MOVES COMPLETED =    30
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	0	1	3	37	94	2	0	0
0	0	1	26	34	89	92	15	0	0
0	0	0	25	69	84	72	8	0	0
0	0	0	2	9	50	44	4	0	0
0	0	0	0	2	6	4	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .12725E+08
  CHEM.TIME(DAYS)    =   .14728E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .40323E+00
 NO. MOVES COMPLETED =    40
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	1	2	4	31	95	3	0	0
0	0	2	23	44	90	93	6	0	0
0	0	1	46	79	88	87	8	1	0
0	0	0	6	16	72	59	7	1	0
0	0	0	1	6	39	8	3	0	0
0	0	0	0	1	3	3	1	0	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .12725E+08
  CHEM.TIME(DAYS)    =   .14728E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .40323E+00
```

NO. MOVES COMPLETED = 40

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	1	1	3	31	94	2	0	0
0	0	2	23	43	89	93	6	0	0
0	0	0	45	78	87	87	8	0	0
0	0	0	5	16	72	58	6	0	0
0	0	0	0	5	39	7	2	0	0
0	0	0	0	0	3	3	0	0	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

NUMBER OF TIME STEPS = 1
DELTA T = .15779E+09
TIME(SECONDS) = .15779E+09
CHEM.TIME(SECONDS) = .15906E+08
CHEM.TIME(DAYS) = .18410E+03
TIME(YEARS) = .50000E+01
CHEM.TIME(YEARS) = .50403E+00
NO. MOVES COMPLETED = 50

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	32	95	3	0	0
0	0	4	26	40	90	93	15	0	0
0	0	2	65	82	89	88	8	1	0
0	0	1	11	23	79	59	8	1	0
0	0	0	1	12	57	10	5	1	0
0	0	0	0	2	7	7	2	0	0
0	0	0	0	0	0	0	0	0	0

TIME VERSUS HEAD AND CONCENTRATION AT SELECTED OBSERVATION POINTS

PUMPING PERIOD NO. 1

STEADY-STATE SOLUTION

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	1	3 4	
			0
.0	.0	.000	
			1
23.7	.0	.010	
			2

23.7	.0	.020	3
23.7	.0	.030	4
23.7	.0	.040	5
23.7	.0	.050	6
23.7	.0	.060	7
23.7	.0	.071	8
23.7	.0	.081	9
23.7	.0	.091	10
23.7	-.1	.101	11
23.7	-.1	.111	12
23.7	-.1	.121	13
23.7	-.1	.131	14
23.7	-.1	.141	15
23.7	-.1	.151	16
23.7	-.1	.161	17
23.7	-.1	.171	18
23.7	-.1	.181	19
23.7	-.1	.192	20
23.7	-.1	.202	21
23.7	.0	.212	22
23.7	.0	.222	23
23.7	.0	.232	24
23.7	.0	.242	25
23.7	.0	.252	26
23.7	.0	.262	27
23.7	.0	.272	28

.0	.0	.000	1
-4.1	.0	.010	2
-4.1	.0	.020	3
-4.1	.0	.030	4
-4.1	.0	.040	5
-4.1	.0	.050	6
-4.1	.0	.060	7
-4.1	.0	.071	8
-4.1	.0	.081	9
-4.1	.0	.091	10
-4.1	.0	.101	11
-4.1	.0	.111	12
-4.1	.0	.121	13
-4.1	.0	.131	14
-4.1	.0	.141	15
-4.1	.0	.151	16
-4.1	.0	.161	17
-4.1	.0	.171	18
-4.1	.0	.181	19
-4.1	.0	.192	20
-4.1	.1	.202	21
-4.1	.1	.212	22
-4.1	.1	.222	23
-4.1	.1	.232	24
-4.1	.4	.242	25
-4.1	.4	.252	26

-4.1	.5	.262	27
-4.1	.6	.272	28
-4.1	.7	.282	29
-4.1	.7	.292	30
-4.1	.8	.302	31
-4.1	.9	.313	32
-4.1	.9	.323	33
-4.1	.7	.333	34
-4.1	.8	.343	35
-4.1	.9	.353	36
-4.1	1.0	.363	37
-4.1	1.1	.373	38
-4.1	1.2	.383	39
-4.1	.6	.393	40
-4.1	.6	.403	41
-4.1	.7	.413	42
-4.1	.8	.423	43
-4.1	.9	.433	44
-4.1	1.1	.444	45
-4.1	1.2	.454	46
-4.1	1.3	.464	47
-4.1	1.5	.474	48
-4.1	1.6	.484	49
-4.1	1.8	.494	50
-4.1	1.9	.504	

O OBS.WELL NO. X Y N
HEAD (FT) CONC.(MG/L) TIME (YEARS)

3 5 8

.0	.0	.000	0
8.9	.0	.010	1
8.9	.0	.020	2
8.9	.0	.030	3
8.9	.0	.040	4
8.9	.0	.050	5
8.9	.1	.060	6
8.9	.2	.071	7
8.9	.2	.081	8
8.9	.6	.091	9
8.9	1.0	.101	10
8.9	1.2	.111	11
8.9	1.8	.121	12
8.9	2.0	.131	13
8.9	2.3	.141	14
8.9	3.1	.151	15
8.9	4.0	.161	16
8.9	4.3	.171	17
8.9	5.2	.181	18
8.9	6.0	.192	19
8.9	6.7	.202	20
8.9	10.3	.212	21
8.9	14.7	.222	22
8.9	20.5	.232	23
			24

8.9	24.5	.242	25
8.9	34.3	.252	26
8.9	37.2	.262	27
8.9	42.0	.272	28
8.9	47.1	.282	29
8.9	49.9	.292	30
8.9	50.6	.302	31
8.9	54.7	.313	32
8.9	55.6	.323	33
8.9	60.4	.333	34
8.9	63.6	.343	35
8.9	65.0	.353	36
8.9	66.8	.363	37
8.9	68.5	.373	38
8.9	70.1	.383	39
8.9	70.9	.393	40
8.9	72.1	.403	41
8.9	73.4	.413	42
8.9	74.6	.423	43
8.9	75.9	.433	44
8.9	76.5	.444	45
8.9	77.2	.454	46
8.9	78.0	.464	47
8.9	78.2	.474	48
8.9	78.4	.484	49
8.9	78.7	.494	50

8.9 79.2 .504

0 HEAD (FT)	OBS.WELL NO. CONC.(MG/L)	X TIME (YEARS)	Y	N
	4	8	9	
.0	.0	.000		0
7.6	.0	.010		1
7.6	.0	.020		2
7.6	.0	.030		3
7.6	.0	.040		4
7.6	.0	.050		5
7.6	.0	.060		6
7.6	.0	.071		7
7.6	.0	.081		8
7.6	.0	.091		9
7.6	.0	.101		10
7.6	.0	.111		11
7.6	.0	.121		12
7.6	.0	.131		13
7.6	.0	.141		14
7.6	.0	.151		15
7.6	.0	.161		16
7.6	.0	.171		17
7.6	.0	.181		18
7.6	.0	.192		19
7.6	.0	.202		20
7.6	.0	.212		21
				22

7.6	.0	.222	23
7.6	.0	.232	24
7.6	.0	.242	25
7.6	.0	.252	26
7.6	.0	.262	27
7.6	.1	.272	28
7.6	.1	.282	29
7.6	.1	.292	30
7.6	.1	.302	31
7.6	.1	.313	32
7.6	.2	.323	33
7.6	.2	.333	34
7.6	.2	.343	35
7.6	.3	.353	36
7.6	.3	.363	37
7.6	.3	.373	38
7.6	.5	.383	39
7.6	.5	.393	40
7.6	.5	.403	41
7.6	.6	.413	42
7.6	.6	.423	43
7.6	.7	.433	44
7.6	.7	.444	45
7.6	.7	.454	46
7.6	.8	.464	47
7.6	.8	.474	48

7.6	.8	.484	49
7.6	.9	.494	50
7.6	.9	.504	

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .19087E+08
  CHEM.TIME(DAYS)    =   .22092E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .60484E+00
 NO. MOVES COMPLETED =    60
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	37	95	3	0	0
0	0	4	33	36	90	94	7	0	0
0	0	4	64	83	89	88	9	1	0
0	0	1	19	28	80	51	8	1	0
0	0	0	2	44	69	13	7	1	0
0	0	0	0	16	28	10	4	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .19087E+08
  CHEM.TIME(DAYS)    =   .22092E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .60484E+00
 NO. MOVES COMPLETED =    60
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	2	1	3	37	94	3	0	0
0	0	4	32	35	90	93	6	0	0
0	0	3	63	83	89	87	8	0	0
0	0	1	18	28	80	50	7	0	0
0	0	0	2	43	69	13	6	1	0
0	0	0	0	15	27	9	4	0	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .22268E+08
  CHEM.TIME(DAYS)    =   .25774E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .70564E+00
 NO. MOVES COMPLETED =    70
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	3	31	95	9	0	0
0	0	4	28	45	90	93	7	0	0
0	0	5	74	84	90	88	8	1	0
0	0	1	23	33	82	48	7	1	0
0	0	0	6	65	74	15	7	1	0
0	0	0	0	44	48	12	5	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .22268E+08
  CHEM.TIME(DAYS)    =   .25774E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .70564E+00
 NO. MOVES COMPLETED =    70
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	2	2	3	30	94	9	0	0
0	0	4	28	44	89	93	6	0	0
0	0	5	73	84	89	87	8	0	0
0	0	1	23	33	81	48	7	0	0
0	0	0	6	64	74	14	7	1	0
0	0	0	0	44	48	12	5	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .25450E+08
  CHEM.TIME(DAYS)    =   .29456E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .80645E+00
```

NO. MOVES COMPLETED = 80

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	34	95	3	0	0
0	0	5	31	38	90	93	15	0	0
0	0	5	75	84	89	88	8	1	0
0	0	4	27	38	82	51	8	1	0
0	0	1	8	70	77	15	7	1	0
0	0	0	1	60	57	15	6	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

NUMBER OF TIME STEPS = 1
DELTA T = .15779E+09
TIME(SECONDS) = .15779E+09
CHEM.TIME(SECONDS) = .25450E+08
CHEM.TIME(DAYS) = .29456E+03
TIME(YEARS) = .50000E+01
CHEM.TIME(YEARS) = .80645E+00
NO. MOVES COMPLETED = 80

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	2	1	3	33	94	3	0	0
0	0	4	31	38	90	93	15	0	0
0	0	4	74	84	89	87	8	0	0
0	0	4	27	37	81	51	7	0	0
0	0	0	8	69	76	14	7	1	0
0	0	0	0	59	57	15	6	1	0
0	0	0	0	0	0	0	0	0	0

NPCELL

```
*****************************
***  6  6  6  7  6  8  9***
*** 13 21 18 14 15 18 18***
*** 18 25 20 15  9 16 19***
***  9 21 11 17  5 10 15***
***  9 17 16 16 16 15 21***
***  6 20 22  9 13 13 18***
*** 10  0  0 16 11 20 14***
***  8  6  6 25 10 18 17***
*** 10  9  9  9  9  9  9***
*****************************
```

CONCENTRATION

NUMBER OF TIME STEPS = 1

```
        DELTA T          =   .15779E+09
        TIME(SECONDS)    =   .15779E+09
  CHEM.TIME(SECONDS)     =   .28631E+08
  CHEM.TIME(DAYS)        =   .33138E+03
        TIME(YEARS)      =   .50000E+01
  CHEM.TIME(YEARS)       =   .90726E+00
 NO. MOVES COMPLETED     =    90

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    4    0    0    0
0    0    2    2    5   44   87    3    0    0
0    0    5   25   53   81   85    8    0    0
0    0    5   71   86   89   88   13    1    0
0    0    6   28   59   80   64    9    1    0
0    0    1    9   71   77   27    7    1    0
0    0    0    2   64   66   16    7    1    0
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =     1
        DELTA T          =   .15779E+09
        TIME(SECONDS)    =   .15779E+09
  CHEM.TIME(SECONDS)     =   .28631E+08
  CHEM.TIME(DAYS)        =   .33138E+03
        TIME(YEARS)      =   .50000E+01
  CHEM.TIME(YEARS)       =   .90726E+00
 NO. MOVES COMPLETED     =    90

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    1    1    4   43   86    3    0    0
0    0    4   25   53   81   85    8    0    0
0    0    4   70   85   88   87   13    0    0
0    0    6   27   59   80   64    9    1    0
0    0    0    8   71   76   26    7    1    0
0    0    0    2   64   66   15    6    1    0
0    0    0    0    0    0    0    0    0    0

 CONCENTRATION

 NUMBER OF TIME STEPS =     1
        DELTA T          =   .15779E+09
        TIME(SECONDS)    =   .15779E+09
  CHEM.TIME(SECONDS)     =   .31812E+08
  CHEM.TIME(DAYS)        =   .36820E+03
        TIME(YEARS)      =   .50000E+01
  CHEM.TIME(YEARS)       =   .10081E+01
 NO. MOVES COMPLETED     =   100
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	3	0	0	0
0	0	2	2	4	30	93	3	0	0
0	0	6	26	53	84	87	25	1	0
0	0	7	68	81	82	68	10	1	0
0	0	7	37	82	84	51	12	1	0
0	0	2	24	71	73	39	8	1	0
0	0	0	3	67	63	16	7	1	0
0	0	0	0	0	0	0	0	0	0

HEAD (FT)	CONC. (MG/L)	OBS. WELL NO. X Y TIME (YEARS)	N
		1 3 4	
.0	.0	.000	0
23.7	.0	.514	1
23.7	.0	.524	2
23.7	.0	.534	3
23.7	.0	.544	4
23.7	.0	.554	5
23.7	.0	.565	6
23.7	.0	.575	7
23.7	.0	.585	8
23.7	.0	.595	9
23.7	.0	.605	10
23.7	.0	.615	11
23.7	.0	.625	12
23.7	.0	.635	13
23.7	.0	.645	14
23.7	.0	.655	15
			16

23.7	.0	.665	17
23.7	.0	.675	18
23.7	.0	.685	19
23.7	.0	.696	20
23.7	.0	.706	21
23.7	.0	.716	22
23.7	.0	.726	23
23.7	.0	.736	24
23.7	.0	.746	25
23.7	.0	.756	26
23.7	.0	.766	27
23.7	.0	.776	28
23.7	.0	.786	29
23.7	.0	.796	30
23.7	.0	.806	31
23.7	.0	.817	32
23.7	.0	.827	33
23.7	.0	.837	34
23.7	.0	.847	35
23.7	.0	.857	36
23.7	.1	.867	37
23.7	.1	.877	38
23.7	.1	.887	39
23.7	.1	.897	40
23.7	.1	.907	41
23.7	.1	.917	42

23.7	.0	.927	43
23.7	.0	.937	44
23.7	.0	.948	45
23.7	.0	.958	46
23.7	.0	.968	47
23.7	.0	.978	48
23.7	.0	.988	49
23.7	.0	.998	50
23.7	.0	1.008	

HEAD (FT)	CONC. (MG/L)	TIME (YEARS)	N
	OBS.WELL NO. 2	X 2 Y 7	
.0	.0	.000	0
-4.1	2.1	.514	1
-4.1	2.2	.524	2
-4.1	2.2	.534	3
-4.1	2.3	.544	4
-4.1	2.4	.554	5
-4.1	2.4	.565	6
-4.1	2.6	.575	7
-4.1	2.7	.585	8
-4.1	3.5	.595	9
-4.1	3.6	.605	10
-4.1	3.9	.615	11
-4.1	4.0	.625	12
-4.1	4.7	.635	13
			14

-4.1	4.8	.645	15
-4.1	4.0	.655	16
-4.1	4.2	.665	17
-4.1	4.3	.675	18
-4.1	4.0	.685	19
-4.1	5.1	.696	20
-4.1	5.4	.706	21
-4.1	5.6	.716	22
-4.1	5.7	.726	23
-4.1	5.2	.736	24
-4.1	5.3	.746	25
-4.1	5.5	.756	26
-4.1	4.9	.766	27
-4.1	5.1	.776	28
-4.1	4.7	.786	29
-4.1	4.9	.796	30
-4.1	4.9	.806	31
-4.1	5.1	.817	32
-4.1	3.5	.827	33
-4.1	3.7	.837	34
-4.1	3.9	.847	35
-4.1	4.0	.857	36
-4.1	4.2	.867	37
-4.1	4.4	.877	38
-4.1	4.6	.887	39
-4.1	4.7	.897	40

-4.1	4.9	.907	41
-4.1	5.3	.917	42
-4.1	5.6	.927	43
-4.1	5.8	.937	44
-4.1	6.0	.948	45
-4.1	6.1	.958	46
-4.1	6.3	.968	47
-4.1	6.9	.978	48
-4.1	7.1	.988	49
-4.1	7.3	.998	50
-4.1	7.5	1.008	

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	3	5 8	
.0	.0	.000	0
8.9	79.2	.514	1
8.9	79.3	.524	2
8.9	79.4	.534	3
8.9	79.6	.544	4
8.9	79.6	.554	5
8.9	79.7	.565	6
8.9	79.9	.575	7
8.9	80.0	.585	8
8.9	80.1	.595	9
8.9	80.2	.605	10
8.9	80.5	.615	11
			12

8.9	80.7	.625	13
8.9	80.8	.635	14
8.9	80.9	.645	15
8.9	81.1	.655	16
8.9	81.3	.665	17
8.9	81.3	.675	18
8.9	81.4	.685	19
8.9	81.5	.696	20
8.9	81.6	.706	21
8.9	81.6	.716	22
8.9	81.5	.726	23
8.9	81.6	.736	24
8.9	81.7	.746	25
8.9	81.6	.756	26
8.9	81.6	.766	27
8.9	81.7	.776	28
8.9	81.7	.786	29
8.9	81.7	.796	30
8.9	81.7	.806	31
8.9	81.8	.817	32
8.9	81.9	.827	33
8.9	81.9	.837	34
8.9	81.9	.847	35
8.9	82.0	.857	36
8.9	81.7	.867	37
8.9	81.5	.877	38

8.9	83.2	.887	39
8.9	82.4	.897	40
8.9	80.3	.907	41
8.9	80.7	.917	42
8.9	81.3	.927	43
8.9	82.5	.937	44
8.9	82.9	.948	45
8.9	82.6	.958	46
8.9	82.6	.968	47
8.9	82.9	.978	48
8.9	84.0	.988	49
8.9	83.7	.998	50
8.9	84.1	1.008	N

OBS.WELL NO. X Y

4 8 9

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
.0	.0	.000	0
7.6	.9	.514	1
7.6	1.0	.524	2
7.6	1.0	.534	3
7.6	1.0	.544	4
7.6	1.0	.554	5
7.6	1.0	.565	6
7.6	1.1	.575	7
7.6	1.1	.585	8
7.6	1.1	.595	9
			10

7.6	1.1	.605	11
7.6	1.1	.615	12
7.6	1.1	.625	13
7.6	1.1	.635	14
7.6	1.1	.645	15
7.6	1.1	.655	16
7.6	1.2	.665	17
7.6	1.2	.675	18
7.6	1.2	.685	19
7.6	1.2	.696	20
7.6	1.1	.706	21
7.6	1.2	.716	22
7.6	1.2	.726	23
7.6	1.2	.736	24
7.6	1.2	.746	25
7.6	1.2	.756	26
7.6	1.2	.766	27
7.6	1.2	.776	28
7.6	1.2	.786	29
7.6	1.2	.796	30
7.6	1.2	.806	31
7.6	1.2	.817	32
7.6	1.2	.827	33
7.6	1.2	.837	34
7.6	1.2	.847	35
7.6	1.2	.857	36

7.6	1.2	.867	37
7.6	1.2	.877	38
7.6	1.2	.887	39
7.6	1.2	.897	40
7.6	1.2	.907	41
7.6	1.2	.917	42
7.6	1.2	.927	43
7.6	1.2	.937	44
7.6	1.2	.948	45
7.6	1.2	.958	46
7.6	1.2	.968	47
7.6	1.2	.978	48
7.6	1.2	.988	49
7.6	1.2	.998	50
7.6	1.3	1.008	

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .34993E+08
  CHEM.TIME(DAYS)    =   .40501E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .11089E+01
 NO. MOVES COMPLETED =   110
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	28	95	3	0	0
0	0	5	22	46	89	93	7	1	0
0	0	11	68	79	86	78	8	1	0
0	0	7	55	84	82	43	8	1	0
0	0	2	33	75	75	29	7	1	0
0	0	0	5	68	66	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .34993E+08
  CHEM.TIME(DAYS)    =   .40501E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .11089E+01
 NO. MOVES COMPLETED =   110
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	1	1	3	28	94	3	0	0
0	0	5	21	45	89	92	6	0	0
0	0	11	68	79	85	78	8	0	0
0	0	7	54	84	82	42	8	1	0
0	0	1	33	74	75	28	7	1	0
0	0	0	4	68	65	25	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .38174E+08
  CHEM.TIME(DAYS)    =   .44183E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .12097E+01
 NO. MOVES COMPLETED =   120
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	3	29	95	9	0	0
0	0	5	18	46	90	93	7	0	0
0	0	10	69	82	88	83	8	1	0
0	0	13	63	82	78	58	7	1	0
0	0	2	43	79	82	18	8	1	0
0	0	0	5	70	68	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .38174E+08
  CHEM.TIME(DAYS)    =   .44183E+03
       TIME(YEARS)   =   .50000E+01
```

CHEM.TIME(YEARS) = .12097E+01
NO. MOVES COMPLETED = 120

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	2	1	3	29	94	9	0	0
0	0	4	17	46	89	92	7	0	0
0	0	10	68	82	88	82	8	0	0
0	0	12	63	82	78	57	7	1	0
0	0	2	42	79	82	17	7	1	0
0	0	0	5	70	67	25	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

NUMBER OF TIME STEPS = 1
DELTA T = .15779E+09
TIME(SECONDS) = .15779E+09
CHEM.TIME(SECONDS) = .41356E+08
CHEM.TIME(DAYS) = .47865E+03
TIME(YEARS) = .50000E+01
CHEM.TIME(YEARS) = .13105E+01
NO. MOVES COMPLETED = 130

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	3	30	95	3	0	0
0	0	6	29	47	90	93	14	0	0
0	0	16	72	84	89	88	9	1	0
0	0	10	73	82	83	51	7	1	0
0	0	3	57	78	78	14	6	1	0
0	0	0	6	71	71	23	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

NUMBER OF TIME STEPS = 1
DELTA T = .15779E+09
TIME(SECONDS) = .15779E+09
CHEM.TIME(SECONDS) = .41356E+08
CHEM.TIME(DAYS) = .47865E+03
TIME(YEARS) = .50000E+01
CHEM.TIME(YEARS) = .13105E+01
NO. MOVES COMPLETED = 130

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	2	0	0	0

0	0	2	2	3	29	94	3	0	0
0	0	6	28	47	89	93	13	0	0
0	0	15	71	84	89	87	8	0	0
0	0	9	73	82	83	50	7	1	0
0	0	3	57	78	77	14	6	1	0
0	0	0	5	71	70	22	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
   CHEM.TIME(SECONDS) =  .44537E+08
   CHEM.TIME(DAYS)    =  .51547E+03
        TIME(YEARS)   =  .50000E+01
   CHEM.TIME(YEARS)   =  .14113E+01
  NO. MOVES COMPLETED =  140
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	30	95	3	0	0
0	0	6	29	47	90	93	7	0	0
0	0	23	77	85	90	88	9	1	0
0	0	9	71	82	84	52	8	1	0
0	0	4	57	79	79	14	7	1	0
0	0	1	6	74	72	19	6	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
   CHEM.TIME(SECONDS) =  .44537E+08
   CHEM.TIME(DAYS)    =  .51547E+03
        TIME(YEARS)   =  .50000E+01
   CHEM.TIME(YEARS)   =  .14113E+01
  NO. MOVES COMPLETED =  140
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	2	2	3	29	94	3	0	0
0	0	6	29	47	89	93	6	0	0
0	0	22	77	85	90	87	8	0	0
0	0	8	70	81	83	51	7	1	0
0	0	3	56	78	78	13	7	1	0
0	0	0	6	74	71	19	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .47718E+08
  CHEM.TIME(DAYS)    =   .55229E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .15121E+01
 NO. MOVES COMPLETED =   150
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	29	95	3	0	0
0	0	8	30	47	90	93	15	0	0
0	0	27	78	85	90	88	9	1	0
0	0	17	78	82	84	45	7	1	0
0	0	12	60	76	81	15	7	1	0
0	0	1	7	76	72	18	7	1	0
0	0	0	0	0	0	0	0	0	0

HEAD (FT)	CONC.(MG/L)	OBS.WELL NO. X Y TIME (YEARS)	N
		1 3 4	
.0	.0	.000	0
23.7	.0	1.018	1
23.7	.0	1.028	2
23.7	.0	1.038	3
23.7	.0	1.048	4
23.7	.0	1.058	5
23.7	.0	1.069	6
23.7	.0	1.079	7
23.7	.0	1.089	8
23.7	.0	1.099	9
23.7	.0	1.109	10

23.7	.0	1.119	11
23.7	.0	1.129	12
23.7	.0	1.139	13
23.7	.0	1.149	14
23.7	.0	1.159	15
23.7	.0	1.169	16
23.7	.0	1.179	17
23.7	.0	1.190	18
23.7	.0	1.200	19
23.7	.0	1.210	20
23.7	.0	1.220	21
23.7	.0	1.230	22
23.7	.0	1.240	23
23.7	.0	1.250	24
23.7	.0	1.260	25
23.7	.0	1.270	26
23.7	.0	1.280	27
23.7	.0	1.290	28
23.7	.0	1.300	29
23.7	.0	1.310	30
23.7	.0	1.321	31
23.7	.0	1.331	32
23.7	.0	1.341	33
23.7	.0	1.351	34
23.7	.0	1.361	35
23.7	.0	1.371	36

23.7	.0	1.381	37
23.7	.0	1.391	38
23.7	.0	1.401	39
23.7	.0	1.411	40
23.7	.0	1.421	41
23.7	.0	1.431	42
23.7	.0	1.442	43
23.7	.0	1.452	44
23.7	.0	1.462	45
23.7	.0	1.472	46
23.7	.0	1.482	47
23.7	.0	1.492	48
23.7	.0	1.502	49
23.7	.0	1.512	50

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
	OBS.WELL NO. 2	X 2 Y 7	
.0	.0	.000	0
-4.1	7.8	1.018	1
-4.1	8.1	1.028	2
-4.1	8.2	1.038	3
-4.1	9.4	1.048	4
-4.1	9.2	1.058	5
-4.1	8.4	1.069	6
-4.1	8.5	1.079	7
-4.1	8.6	1.089	8

-4.1	10.9	1.099	9
-4.1	11.0	1.109	10
-4.1	11.6	1.119	11
-4.1	12.2	1.129	12
-4.1	12.3	1.139	13
-4.1	12.8	1.149	14
-4.1	12.9	1.159	15
-4.1	13.0	1.169	16
-4.1	13.0	1.179	17
-4.1	10.1	1.190	18
-4.1	10.2	1.200	19
-4.1	10.3	1.210	20
-4.1	10.5	1.220	21
-4.1	10.6	1.230	22
-4.1	10.7	1.240	23
-4.1	10.8	1.250	24
-4.1	10.6	1.260	25
-4.1	10.7	1.270	26
-4.1	10.9	1.280	27
-4.1	11.0	1.290	28
-4.1	15.8	1.300	29
-4.1	15.8	1.310	30
-4.1	15.9	1.321	31
-4.1	19.6	1.331	32
-4.1	19.6	1.341	33
-4.1	19.6	1.351	34

			35
-4.1	19.7	1.361	36
-4.1	19.7	1.371	37
-4.1	19.8	1.381	38
-4.1	22.6	1.391	39
-4.1	22.6	1.401	40
-4.1	22.7	1.411	41
-4.1	19.4	1.421	42
-4.1	19.5	1.431	43
-4.1	19.6	1.442	44
-4.1	26.9	1.452	45
-4.1	26.9	1.462	46
-4.1	27.4	1.472	47
-4.1	27.4	1.482	48
-4.1	33.4	1.492	49
-4.1	33.4	1.502	50
-4.1	26.6	1.512	N

HEAD (FT)	CONC. (MG/L)	OBS.WELL NO. 3 / TIME (YEARS)	X 5	Y 8
				0
.0	.0	.000		1
8.9	84.0	1.018		2
8.9	83.8	1.028		3
8.9	85.0	1.038		4
8.9	85.7	1.048		5
8.9	86.4	1.058		6
8.9	86.5	1.069		

7.6	1.3	1.058	5
7.6	1.3	1.069	6
7.6	1.3	1.079	7
7.6	1.3	1.089	8
7.6	1.3	1.099	9
7.6	1.4	1.109	10
7.6	1.4	1.119	11
7.6	1.4	1.129	12
7.6	1.4	1.139	13
7.6	1.4	1.149	14
7.6	1.3	1.159	15
7.6	1.4	1.169	16
7.6	1.3	1.179	17
7.6	1.4	1.190	18
7.6	1.4	1.200	19
7.6	1.4	1.210	20
7.6	1.4	1.220	21
7.6	1.4	1.230	22
7.6	1.3	1.240	23
7.6	1.3	1.250	24
7.6	1.3	1.260	25
7.6	1.3	1.270	26
7.6	1.3	1.280	27
7.6	1.3	1.290	28
7.6	1.3	1.300	29
7.6	1.3	1.310	30

7.6	1.3	1.321	31
7.6	1.3	1.331	32
7.6	1.3	1.341	33
7.6	1.2	1.351	34
7.6	1.3	1.361	35
7.6	1.3	1.371	36
7.6	1.3	1.381	37
7.6	1.3	1.391	38
7.6	1.3	1.401	39
7.6	1.3	1.411	40
7.6	1.3	1.421	41
7.6	1.3	1.431	42
7.6	1.3	1.442	43
7.6	1.3	1.452	44
7.6	1.3	1.462	45
7.6	1.3	1.472	46
7.6	1.3	1.482	47
7.6	1.2	1.492	48
7.6	1.2	1.502	49
7.6	1.3	1.512	50

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .50899E+08
  CHEM.TIME(DAYS)    =   .58911E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .16129E+01
 NO. MOVES COMPLETED =   160
```

0 0 0 0 0 0 0 0 0 0

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	28	95	3	0	0
0	0	7	26	47	90	93	7	0	0
0	0	32	79	85	90	88	9	1	0
0	0	23	76	82	84	45	7	1	0
0	0	6	72	79	81	15	7	1	0
0	0	1	14	77	75	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .50899E+08
  CHEM.TIME(DAYS)    =   .58911E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .16129E+01
 NO. MOVES COMPLETED =   160
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	2	0	0	0
0	0	2	2	3	28	94	3	0	0
0	0	6	26	47	90	93	6	0	0
0	0	31	78	85	89	87	8	0	0
0	0	22	76	81	83	45	7	0	0
0	0	6	72	79	81	15	7	1	0
0	0	0	14	76	74	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .54080E+08
  CHEM.TIME(DAYS)    =   .62593E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .17137E+01
 NO. MOVES COMPLETED =   170
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	28	95	3	0	0
0	0	7	31	47	90	93	13	0	0
0	0	18	79	85	90	88	9	1	0
0	0	33	77	82	84	52	7	1	0

0	0	6	70	78	81	15	7	1	0
0	0	1	22	78	76	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .54080E+08
  CHEM.TIME(DAYS)    =   .62593E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .17137E+01
 NO. MOVES COMPLETED =   170
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	2	2	3	28	94	2	0	0
0	0	7	30	47	89	93	12	0	0
0	0	17	78	85	90	87	9	0	0
0	0	33	77	81	83	51	7	1	0
0	0	6	70	78	81	14	7	1	0
0	0	0	21	78	75	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .57262E+08
  CHEM.TIME(DAYS)    =   .66275E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .18145E+01
 NO. MOVES COMPLETED =   180
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	5	1	0	0
0	0	2	2	4	38	80	3	0	0
0	0	9	22	40	80	84	16	0	0
0	0	24	76	86	89	60	13	1	0
0	0	39	78	85	84	57	7	1	0
0	0	7	71	79	70	27	9	1	0
0	0	1	22	78	77	18	6	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
```

```
   CHEM.TIME(SECONDS)  =    .57262E+08
   CHEM.TIME(DAYS)     =    .66275E+03
        TIME(YEARS)    =    .50000E+01
   CHEM.TIME(YEARS)    =    .18145E+01
  NO. MOVES COMPLETED  =    180

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     1     5     0     0     0
0     0     1     2     3    37    80     2     0     0
0     0     8    21    39    79    83    15     0     0
0     0    24    76    85    89    60    13     0     0
0     0    38    78    84    83    56     7     1     0
0     0     7    71    79    70    27     8     1     0
0     0     0    22    78    76    17     6     1     0
0     0     0     0     0     0     0     0     0     0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .60443E+08
   CHEM.TIME(DAYS)    =    .69957E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .19153E+01
  NO. MOVES COMPLETED =    190

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     1     3     0     0     0
0     0     2     2     4    34    94     3     0     0
0     0     9    29    42    88    92     6     1     0
0     0    40    76    80    81    80     9     1     0
0     0    33    81    88    87    46    10     1     0
0     0    16    73    81    75    39     7     1     0
0     0     1    28    78    71    21     8     1     0
0     0     0     0     0     0     0     0     0     0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .60443E+08
   CHEM.TIME(DAYS)    =    .69957E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .19153E+01
  NO. MOVES COMPLETED =    190

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	2	1	3	33	94	3	0	0
0	0	9	28	41	87	91	6	0	0
0	0	39	75	79	81	80	8	0	0
0	0	32	80	87	86	46	9	1	0
0	0	16	73	80	74	38	6	1	0
0	0	0	28	78	71	21	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .63624E+08
  CHEM.TIME(DAYS)    =   .73639E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .20161E+01
 NO. MOVES COMPLETED =   200
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	37	95	3	0	0
0	0	10	32	36	90	93	16	0	0
0	0	44	77	81	88	75	9	1	0
0	0	38	80	86	80	52	7	1	0
0	0	23	75	83	79	17	8	1	0
0	0	1	29	79	70	31	7	1	0
0	0	0	0	0	0	0	0	0	0

HEAD (FT)	CONC.(MG/L)	OBS.WELL NO. X Y TIME (YEARS)	N
		1 3 4	
			0
.0	.0	.000	
			1
23.7	.1	1.522	
			2
23.7	.0	1.532	
			3
23.7	.0	1.542	
			4
23.7	.0	1.552	
			5
23.7	.0	1.562	
			6
23.7	.0	1.573	
			7

23.7	.0	1.583	8
23.7	.0	1.593	9
23.7	.0	1.603	10
23.7	.0	1.613	11
23.7	.0	1.623	12
23.7	.0	1.633	13
23.7	.0	1.643	14
23.7	.0	1.653	15
23.7	.0	1.663	16
23.7	.0	1.673	17
23.7	.0	1.683	18
23.7	.0	1.694	19
23.7	.0	1.704	20
23.7	.0	1.714	21
23.7	.1	1.724	22
23.7	.1	1.734	23
23.7	.1	1.744	24
23.7	.1	1.754	25
23.7	.1	1.764	26
23.7	.1	1.774	27
23.7	.0	1.784	28
23.7	.0	1.794	29
23.7	.0	1.804	30
23.7	.0	1.815	31
23.7	.0	1.825	32
23.7	.0	1.835	33

23.7	.0	1.845	34
23.7	.0	1.855	35
23.7	.0	1.865	36
23.7	.0	1.875	37
23.7	.0	1.885	38
23.7	.0	1.895	39
23.7	.0	1.905	40
23.7	.0	1.915	41
23.7	.0	1.925	42
23.7	.0	1.935	43
23.7	.0	1.946	44
23.7	.0	1.956	45
23.7	.0	1.966	46
23.7	.0	1.976	47
23.7	.0	1.986	48
23.7	.0	1.996	49
23.7	.0	2.006	50
23.7	.0	2.016	

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	OBS.WELL NO. X Y	N
			2 2 7	
.0	.0	.000		0
-4.1	26.7	1.522		1
-4.1	26.7	1.532		2
-4.1	24.4	1.542		3
-4.1	29.7	1.552		4
				5

-4.1	31.4	1.562	6
-4.1	31.4	1.573	7
-4.1	34.2	1.583	8
-4.1	31.7	1.593	9
-4.1	31.6	1.603	10
-4.1	31.6	1.613	11
-4.1	25.2	1.623	12
-4.1	25.2	1.633	13
-4.1	24.6	1.643	14
-4.1	24.7	1.653	15
-4.1	25.5	1.663	16
-4.1	25.5	1.673	17
-4.1	17.1	1.683	18
-4.1	17.3	1.694	19
-4.1	17.4	1.704	20
-4.1	17.6	1.714	21
-4.1	17.7	1.724	22
-4.1	17.9	1.734	23
-4.1	18.1	1.744	24
-4.1	18.2	1.754	25
-4.1	18.4	1.764	26
-4.1	20.6	1.774	27
-4.1	23.5	1.784	28
-4.1	23.6	1.794	29
-4.1	24.3	1.804	30
-4.1	24.4	1.815	31

-4.1	24.6	1.825	32
-4.1	29.6	1.835	33
-4.1	29.7	1.845	34
-4.1	31.0	1.855	35
-4.1	31.1	1.865	36
-4.1	32.8	1.875	37
-4.1	35.0	1.885	38
-4.1	35.0	1.895	39
-4.1	40.5	1.905	40
-4.1	39.5	1.915	41
-4.1	34.8	1.925	42
-4.1	34.8	1.935	43
-4.1	34.8	1.946	44
-4.1	38.4	1.956	45
-4.1	38.3	1.966	46
-4.1	40.4	1.976	47
-4.1	43.0	1.986	48
-4.1	42.9	1.996	49
-4.1	44.1	2.006	50
-4.1	44.1	2.016	

OBS.WELL NO. X Y N

HEAD (FT) CONC.(MG/L) TIME (YEARS)

3 5 8

.0	.0	.000	0
8.9	83.9	1.522	1
8.9	83.9	1.532	2
			3

8.9	84.0	1.542	4
8.9	84.0	1.552	5
8.9	83.9	1.562	6
8.9	83.9	1.573	7
8.9	83.9	1.583	8
8.9	83.9	1.593	9
8.9	83.8	1.603	10
8.9	83.8	1.613	11
8.9	83.8	1.623	12
8.9	83.8	1.633	13
8.9	83.8	1.643	14
8.9	83.7	1.653	15
8.9	83.7	1.663	16
8.9	83.7	1.673	17
8.9	83.8	1.683	18
8.9	83.8	1.694	19
8.9	83.8	1.704	20
8.9	83.9	1.714	21
8.9	83.8	1.724	22
8.9	83.8	1.734	23
8.9	85.3	1.744	24
8.9	84.0	1.754	25
8.9	81.7	1.764	26
8.9	82.2	1.774	27
8.9	82.9	1.784	28
8.9	84.3	1.794	29

8.9	84.3	1.804	30
8.9	83.9	1.815	31
8.9	83.6	1.825	32
8.9	83.9	1.835	33
8.9	85.0	1.845	34
8.9	84.8	1.855	35
8.9	84.9	1.865	36
8.9	84.7	1.875	37
8.9	84.6	1.885	38
8.9	85.7	1.895	39
8.9	86.3	1.905	40
8.9	86.9	1.915	41
8.9	87.0	1.925	42
8.9	87.0	1.935	43
8.9	85.3	1.946	44
8.9	84.2	1.956	45
8.9	82.6	1.966	46
8.9	82.5	1.976	47
8.9	81.5	1.986	48
8.9	80.7	1.996	49
8.9	80.4	2.006	50
8.9	79.8	2.016	

HEAD (FT)	CONC. (MG/L)	OBS.WELL NO. X Y TIME (YEARS)	N
		4 8 9	
.0	.0	.000	0
			1

7.6	1.3	1.522	
7.6	1.2	1.532	2
7.6	1.2	1.542	3
7.6	1.2	1.552	4
7.6	1.2	1.562	5
7.6	1.2	1.573	6
7.6	1.2	1.583	7
7.6	1.2	1.593	8
7.6	1.2	1.603	9
7.6	1.2	1.613	10
7.6	1.2	1.623	11
7.6	1.2	1.633	12
7.6	1.2	1.643	13
7.6	1.2	1.653	14
7.6	1.2	1.663	15
7.6	1.2	1.673	16
7.6	1.2	1.683	17
7.6	1.2	1.694	18
7.6	1.2	1.704	19
7.6	1.2	1.714	20
7.6	1.2	1.724	21
7.6	1.2	1.734	22
7.6	1.2	1.744	23
7.6	1.2	1.754	24
7.6	1.2	1.764	25
7.6	1.2	1.774	26
			27

7.6	1.2	1.784	28
7.6	1.2	1.794	29
7.6	1.3	1.804	30
7.6	1.2	1.815	31
7.6	1.3	1.825	32
7.6	1.2	1.835	33
7.6	1.2	1.845	34
7.6	1.2	1.855	35
7.6	1.3	1.865	36
7.6	1.3	1.875	37
7.6	1.3	1.885	38
7.6	1.3	1.895	39
7.6	1.3	1.905	40
7.6	1.3	1.915	41
7.6	1.3	1.925	42
7.6	1.3	1.935	43
7.6	1.3	1.946	44
7.6	1.3	1.956	45
7.6	1.4	1.966	46
7.6	1.4	1.976	47
7.6	1.4	1.986	48
7.6	1.4	1.996	49
7.6	1.4	2.006	50
7.6	1.4	2.016	

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
```

```
   CHEM.TIME(SECONDS) =    .66805E+08
   CHEM.TIME(DAYS)    =    .77321E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .21169E+01
  NO. MOVES COMPLETED =    210

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    2    2    4   31   95    3    0    0
0    0   16   30   45   90   93    6    0    0
0    0   43   76   84   89   88    8    1    0
0    0   40   82   84   82   61    8    1    0
0    0   23   76   83   80   17    6    1    0
0    0    1   29   79   72   25    8    2    0
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .66805E+08
   CHEM.TIME(DAYS)    =    .77321E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .21169E+01
  NO. MOVES COMPLETED =    210

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    3    0    0    0
0    0    2    2    3   31   94    2    0    0
0    0   16   30   44   89   93    6    0    0
0    0   43   75   84   89   87    8    0    0
0    0   39   81   84   81   61    7    1    0
0    0   23   75   82   79   16    6    1    0
0    0    0   29   78   71   24    7    1    0
0    0    0    0    0    0    0    0    0    0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .69986E+08
   CHEM.TIME(DAYS)    =    .81003E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .22177E+01
  NO. MOVES COMPLETED =    220

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	3	4	32	95	3	0	0
0	0	11	30	40	90	93	16	0	0
0	0	51	77	85	90	88	8	1	0
0	0	38	82	85	84	60	8	1	0
0	0	27	77	82	79	13	7	1	0
0	0	1	30	80	73	21	7	2	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .69986E+08
  CHEM.TIME(DAYS)    =   .81003E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .22177E+01
 NO. MOVES COMPLETED =   220
```

0	0	[illegible]	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	2	2	3	32	94	2	0	0
0	0	10	29	40	90	93	15	0	0
0	0	50	77	84	89	88	8	0	0
0	0	38	82	85	84	59	7	1	0
0	0	26	76	81	78	13	6	1	0
0	0	0	29	79	73	21	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .73168E+08
  CHEM.TIME(DAYS)    =   .84685E+03
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .23185E+01
 NO. MOVES COMPLETED =   230
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	37	95	3	0	0
0	0	10	36	36	90	94	7	0	0
0	0	58	79	85	90	88	9	1	0
0	0	40	82	85	84	51	8	1	0
0	0	30	76	78	80	15	7	1	0
0	0	4	30	80	73	19	7	1	0

```
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .73168E+08
   CHEM.TIME(DAYS)    =   .84685E+03
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .23185E+01
  NO. MOVES COMPLETED =   230

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    2    0    0    0
0    0    2    2    3   37   94    3    0    0
0    0    9   36   36   90   93    6    0    0
0    0   58   78   85   89   87    8    0    0
0    0   40   82   84   83   51    7    0    0
0    0   29   76   78   80   14    7    1    0
0    0    3   30   79   72   18    6    1    0
0    0    0    0    0    0    0    0    0    0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .76349E+08
   CHEM.TIME(DAYS)    =   .88367E+03
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .24193E+01
  NO. MOVES COMPLETED =   240

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    3    2    4   31   95    9    0    0
0    0   11   30   45   90   93    7    0    0
0    0   47   79   86   90   88    8    1    0
0    0   50   81   85   84   48    7    1    0
0    0   35   78   79   81   15    7    1    0
0    0    4   36   77   75   18    7    1    0
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .76349E+08
   CHEM.TIME(DAYS)    =   .88367E+03
```

```
        TIME(YEARS)     =    .50000E+01
   CHEM.TIME(YEARS)     =    .24193E+01
  NO. MOVES COMPLETED =    240

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    3    0    0    0
0    0    3    2    3   30   94    9    0    0
0    0   11   29   45   89   93    6    0    0
0    0   47   79   85   90   87    8    0    0
0    0   50   80   84   84   48    7    1    0
0    0   35   78   79   81   15    7    1    0
0    0    3   35   77   74   17    6    1    0
0    0    0    0    0    0    0    0    0    0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .79530E+08
   CHEM.TIME(DAYS)    =    .92049E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .25202E+01
  NO. MOVES COMPLETED =    250

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    3    2    4   34   95    3    0    0
0    0   17   33   38   90   93   15    0    0
0    0   48   79   86   90   88    8    1    0
0    0   52   82   84   84   51    8    1    0
0    0   34   80   79   82   16    7    1    0
0    0    4   36   79   76   18    7    1    0
0    0    0    0    0    0    0    0    0    0

                        OBS.WELL NO.    X    Y                    N
HEAD (FT)     CONC.(MG/L)     TIME (YEARS)

                              1          3    4


                                                                 0
     .0              .0            .000
                                                                 1
   23.7              .0           2.026
                                                                 2
   23.7              .0           2.036
                                                                 3
   23.7              .0           2.046
```

23.7	.0	2.056	4
23.7	.0	2.067	5
23.7	.0	2.077	6
23.7	.0	2.087	7
23.7	.0	2.097	8
23.7	.0	2.107	9
23.7	.0	2.117	10
23.7	.0	2.127	11
23.7	.0	2.137	12
23.7	.0	2.147	13
23.7	.0	2.157	14
23.7	.0	2.167	15
23.7	.0	2.177	16
23.7	.0	2.187	17
23.7	.0	2.198	18
23.7	.0	2.208	19
23.7	.1	2.218	20
23.7	.0	2.228	21
23.7	.0	2.238	22
23.7	.0	2.248	23
23.7	.0	2.258	24
23.7	.0	2.268	25
23.7	.0	2.278	26
23.7	.0	2.288	27
23.7	.0	2.298	28
23.7	.0	2.308	29

23.7	.0	2.319	30
23.7	.0	2.329	31
23.7	.0	2.339	32
23.7	.0	2.349	33
23.7	.0	2.359	34
23.7	.1	2.369	35
23.7	.1	2.379	36
23.7	.1	2.389	37
23.7	.0	2.399	38
23.7	.0	2.409	39
23.7	.1	2.419	40
23.7	.1	2.429	41
23.7	.0	2.440	42
23.7	.0	2.450	43
23.7	.0	2.460	44
23.7	.1	2.470	45
23.7	.1	2.480	46
23.7	.0	2.490	47
23.7	.0	2.500	48
23.7	.0	2.510	49
23.7	.0	2.520	50

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	OBS.WELL NO.	X	Y	N
			2	2	7	
.0	.0	.000				0
-4.1	44.0	2.026				1

-4.1	43.9	2.036	2
-4.1	39.6	2.046	3
-4.1	39.6	2.056	4
-4.1	39.6	2.067	5
-4.1	39.6	2.077	6
-4.1	39.6	2.087	7
-4.1	39.5	2.097	8
-4.1	44.8	2.107	9
-4.1	43.5	2.117	10
-4.1	43.4	2.127	11
-4.1	43.4	2.137	12
-4.1	43.3	2.147	13
-4.1	46.7	2.157	14
-4.1	46.6	2.167	15
-4.1	46.6	2.177	16
-4.1	51.1	2.187	17
-4.1	51.0	2.198	18
-4.1	50.8	2.208	19
-4.1	50.7	2.218	20
-4.1	50.6	2.228	21
-4.1	50.4	2.238	22
-4.1	55.5	2.248	23
-4.1	55.4	2.258	24
-4.1	55.2	2.268	25
-4.1	52.2	2.278	26
-4.1	52.0	2.288	27

-4.1	55.7	2.298	28
-4.1	58.3	2.308	29
-4.1	58.1	2.319	30
-4.1	56.1	2.329	31
-4.1	56.0	2.339	32
-4.1	58.7	2.349	33
-4.1	58.5	2.359	34
-4.1	43.8	2.369	35
-4.1	43.8	2.379	36
-4.1	43.8	2.389	37
-4.1	40.3	2.399	38
-4.1	44.3	2.409	39
-4.1	47.3	2.419	40
-4.1	47.3	2.429	41
-4.1	49.3	2.440	42
-4.1	51.8	2.450	43
-4.1	51.7	2.460	44
-4.1	51.6	2.470	45
-4.1	48.1	2.480	46
-4.1	48.0	2.490	47
-4.1	51.2	2.500	48
-4.1	51.1	2.510	49
-4.1	47.5	2.520	50

HEAD (FT)	CONC.(MG/L)	OBS.WELL NO. TIME (YEARS)	X	Y	N
		3	5	8	

.0	.0	.000	0
8.9	79.2	2.026	1
8.9	79.3	2.036	2
8.9	78.8	2.046	3
8.9	78.9	2.056	4
8.9	78.6	2.067	5
8.9	79.6	2.077	6
8.9	80.3	2.087	7
8.9	80.8	2.097	8
8.9	80.9	2.107	9
8.9	81.6	2.117	10
8.9	82.0	2.127	11
8.9	82.5	2.137	12
8.9	83.2	2.147	13
8.9	83.4	2.157	14
8.9	83.6	2.167	15
8.9	84.0	2.177	16
8.9	84.1	2.187	17
8.9	84.1	2.198	18
8.9	84.1	2.208	19
8.9	84.2	2.218	20
8.9	84.1	2.228	21
8.9	84.0	2.238	22
8.9	83.8	2.248	23
8.9	83.7	2.258	24
8.9	83.7	2.268	25

8.9	83.7	2.278	26
8.9	83.6	2.288	27
8.9	83.6	2.298	28
8.9	83.6	2.308	29
8.9	83.6	2.319	30
8.9	83.7	2.329	31
8.9	83.8	2.339	32
8.9	83.9	2.349	33
8.9	83.9	2.359	34
8.9	84.0	2.369	35
8.9	84.0	2.379	36
8.9	84.1	2.389	37
8.9	84.1	2.399	38
8.9	84.1	2.409	39
8.9	84.1	2.419	40
8.9	84.1	2.429	41
8.9	84.0	2.440	42
8.9	84.0	2.450	43
8.9	84.0	2.460	44
8.9	83.9	2.470	45
8.9	83.9	2.480	46
8.9	83.9	2.490	47
8.9	83.9	2.500	48
8.9	83.9	2.510	49
8.9	83.8	2.520	50

OBS.WELL NO. X Y N

HEAD (FT) CONC.(MG/L) TIME (YEARS)

4 8 9

.0	.0	.000	0
7.6	1.4	2.026	1
7.6	1.3	2.036	2
7.6	1.4	2.046	3
7.6	1.4	2.056	4
7.6	1.4	2.067	5
7.6	1.4	2.077	6
7.6	1.4	2.087	7
7.6	1.3	2.097	8
7.6	1.3	2.107	9
7.6	1.3	2.117	10
7.6	1.3	2.127	11
7.6	1.3	2.137	12
7.6	1.3	2.147	13
7.6	1.3	2.157	14
7.6	1.3	2.167	15
7.6	1.3	2.177	16
7.6	1.3	2.187	17
7.6	1.3	2.198	18
7.6	1.2	2.208	19
7.6	1.3	2.218	20
7.6	1.3	2.228	21
7.6	1.3	2.238	22
7.6	1.3	2.248	23

7.6	1.3	2.258	24
7.6	1.3	2.268	25
7.6	1.3	2.278	26
7.6	1.3	2.288	27
7.6	1.3	2.298	28
7.6	1.3	2.308	29
7.6	1.3	2.319	30
7.6	1.3	2.329	31
7.6	1.3	2.339	32
7.6	1.2	2.349	33
7.6	1.2	2.359	34
7.6	1.3	2.369	35
7.6	1.3	2.379	36
7.6	1.2	2.389	37
7.6	1.2	2.399	38
7.6	1.2	2.409	39
7.6	1.2	2.419	40
7.6	1.2	2.429	41
7.6	1.2	2.440	42
7.6	1.2	2.450	43
7.6	1.2	2.460	44
7.6	1.2	2.470	45
7.6	1.2	2.480	46
7.6	1.2	2.490	47
7.6	1.2	2.500	48
7.6	1.2	2.510	49

50

7.6 1.2 2.520

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .82711E+08
  CHEM.TIME(DAYS)    =   .95731E+03
        TIME(YEARS)  =   .50000E+01
  CHEM.TIME(YEARS)   =   .26210E+01
 NO. MOVES COMPLETED =   260
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	4	0	0	0
0	0	2	2	5	44	87	3	0	0
0	0	16	26	53	82	85	8	0	0
0	0	42	79	86	90	88	13	1	0
0	0	56	82	85	81	64	9	1	0
0	0	31	79	79	81	27	7	1	0
0	0	4	42	79	77	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .82711E+08
  CHEM.TIME(DAYS)    =   .95731E+03
        TIME(YEARS)  =   .50000E+01
  CHEM.TIME(YEARS)   =   .26210E+01
 NO. MOVES COMPLETED =   260
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	1	4	43	86	3	0	0
0	0	16	26	52	81	85	8	0	0
0	0	42	78	86	89	87	13	0	0
0	0	56	81	84	81	64	9	1	0
0	0	30	78	79	81	27	7	1	0
0	0	3	41	79	77	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .85892E+08
```

```
   CHEM.TIME(DAYS)      =    .99413E+03
        TIME(YEARS)     =    .50000E+01
   CHEM.TIME(YEARS)     =    .27218E+01
  NO. MOVES COMPLETED =    270

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    2    3    0    0    0
0    0    2    2    4   30   93    3    0    0
0    0   16   27   53   84   87   25    1    0
0    0   51   79   82   83   68   10    1    0
0    0   55   82   87   85   51   12    1    0
0    0   37   79   81   76   39    8    1    0
0    0    4   42   79   71   17    7    1    0
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .85892E+08
   CHEM.TIME(DAYS)    =    .99413E+03
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .27218E+01
  NO. MOVES COMPLETED =    270

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    2    2    4   29   93    3    0    0
0    0   16   27   53   83   86   25    0    0
0    0   51   79   82   82   67   10    0    0
0    0   55   82   87   85   51   11    1    0
0    0   37   78   80   75   38    8    1    0
0    0    3   41   79   70   17    7    1    0
0    0    0    0    0    0    0    0    0    0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .89074E+08
   CHEM.TIME(DAYS)    =    .10309E+04
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .28226E+01
  NO. MOVES COMPLETED =    280

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
```

0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	28	95	3	0	0
0	0	11	25	46	89	93	7	1	0
0	0	57	77	80	86	78	8	1	0
0	0	56	84	87	83	43	8	1	0
0	0	38	79	83	77	29	7	1	0
0	0	4	46	79	72	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .89074E+08
  CHEM.TIME(DAYS)    =   .10309E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .28226E+01
 NO. MOVES COMPLETED =   280
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	2	[illegible]	3	28	94	3	0	0
0	0	11	25	46	89	92	6	0	0
0	0	56	76	79	85	78	8	0	0
0	0	55	83	87	82	43	8	1	0
0	0	38	78	82	76	29	7	1	0
0	0	3	46	79	72	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .92255E+08
  CHEM.TIME(DAYS)    =   .10678E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .29234E+01
 NO. MOVES COMPLETED =   290
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	3	29	95	9	0	0
0	0	10	20	46	90	93	7	0	0
0	0	58	77	83	88	83	8	1	0
0	0	60	85	85	79	58	7	1	0
0	0	43	79	83	83	18	8	1	0
0	0	4	47	80	71	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .92255E+08
  CHEM.TIME(DAYS)    =   .10678E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .29234E+01
 NO. MOVES COMPLETED =   290
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	2	1	3	29	94	9	0	0
0	0	10	20	46	89	92	7	0	0
0	0	57	77	82	88	82	8	0	0
0	0	60	84	85	78	57	7	1	0
0	0	43	79	82	83	17	7	1	0
0	0	3	46	79	71	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .95436E+08
  CHEM.TIME(DAYS)    =   .11046E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .30242E+01
 NO. MOVES COMPLETED =   300
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	3	30	95	3	0	0
0	0	15	32	47	90	93	14	0	0
0	0	62	76	84	89	88	9	1	0
0	0	60	84	86	84	51	7	1	0
0	0	39	80	82	78	14	6	1	0
0	0	4	47	80	73	23	7	2	0
0	0	0	0	0	0	0	0	0	0

OBS.WELL NO. X Y N

HEAD (FT) CONC.(MG/L) TIME (YEARS)

1 3 4

0

.0	.0	.000	1
23.7	.1	2.530	2
23.7	.1	2.540	3
23.7	.0	2.550	4
23.7	.0	2.560	5
23.7	.0	2.571	6
23.7	.1	2.581	7
23.7	.1	2.591	8
23.7	.1	2.601	9
23.7	.1	2.611	10
23.7	.1	2.621	11
23.7	.1	2.631	12
23.7	.0	2.641	13
23.7	.0	2.651	14
23.7	.0	2.661	15
23.7	.0	2.671	16
23.7	.0	2.681	17
23.7	.0	2.692	18
23.7	.0	2.702	19
23.7	.0	2.712	20
23.7	.0	2.722	21
23.7	.0	2.732	22
23.7	.0	2.742	23
23.7	.0	2.752	24
23.7	.0	2.762	25
23.7	.0	2.772	26

23.7	.0	2.782	27
23.7	.0	2.792	28
23.7	.0	2.802	29
23.7	.0	2.812	30
23.7	.0	2.823	31
23.7	.0	2.833	32
23.7	.0	2.843	33
23.7	.0	2.853	34
23.7	.0	2.863	35
23.7	.0	2.873	36
23.7	.0	2.883	37
23.7	.0	2.893	38
23.7	.0	2.903	39
23.7	.0	2.913	40
23.7	.0	2.923	41
23.7	.0	2.933	42
23.7	.0	2.944	43
23.7	.0	2.954	44
23.7	.0	2.964	45
23.7	.0	2.974	46
23.7	.0	2.984	47
23.7	.0	2.994	48
23.7	.0	3.004	49
23.7	.0	3.014	50
23.7	.0	3.024	

OBS.WELL NO. X Y N

HEAD (FT) CONC.(MG/L) TIME (YEARS)

2 2 7

.0	.0	.000	0
-4.1	47.5	2.530	1
-4.1	42.2	2.540	2
-4.1	42.2	2.550	3
-4.1	42.2	2.560	4
-4.1	42.3	2.571	5
-4.1	42.3	2.581	6
-4.1	42.3	2.591	7
-4.1	42.4	2.601	8
-4.1	42.4	2.611	9
-4.1	42.4	2.621	10
-4.1	44.4	2.631	11
-4.1	47.0	2.641	12
-4.1	47.0	2.651	13
-4.1	47.6	2.661	14
-4.1	47.6	2.671	15
-4.1	47.6	2.681	16
-4.1	50.6	2.692	17
-4.1	50.6	2.702	18
-4.1	51.5	2.712	19
-4.1	51.5	2.722	20
-4.1	52.7	2.732	21
-4.1	54.4	2.742	22
-4.1	54.3	2.752	23
			24

-4.1	57.8	2.762	25
-4.1	57.4	2.772	26
-4.1	55.1	2.782	27
-4.1	55.0	2.792	28
-4.1	54.9	2.802	29
-4.1	56.8	2.812	30
-4.1	56.7	2.823	31
-4.1	58.2	2.833	32
-4.1	60.2	2.843	33
-4.1	60.0	2.853	34
-4.1	60.7	2.863	35
-4.1	60.6	2.873	36
-4.1	60.4	2.883	37
-4.1	60.3	2.893	38
-4.1	57.9	2.903	39
-4.1	57.8	2.913	40
-4.1	57.7	2.923	41
-4.1	57.5	2.933	42
-4.1	57.4	2.944	43
-4.1	57.3	2.954	44
-4.1	61.7	2.964	45
-4.1	60.9	2.974	46
-4.1	60.8	2.984	47
-4.1	60.7	2.994	48
-4.1	60.5	3.004	49
-4.1	62.4	3.014	50

-4.1	62.2	2.624			
	OBS.WELL NO.		X	Y	N
HEAD (FT)	CONC.(MG/L)	TIME (YEARS)			
		3	5	8	
					0
.0	.0	.000			
					1
8.9	83.9	2.530			
					2
8.9	83.9	2.540			
					3
8.9	83.9	2.550			
					4
8.9	84.0	2.560			
					5
8.9	84.0	2.571			
					6
8.9	83.9	2.581			
					7
8.9	83.9	2.591			
					8
8.9	85.2	2.601			
					9
8.9	83.6	2.611			
					10
8.9	81.2	2.621			
					11
8.9	81.8	2.631			
					12
8.9	82.5	2.641			
					13
8.9	83.8	2.651			
					14
8.9	83.7	2.661			
					15
8.9	83.8	2.671			
					16
8.9	83.5	2.681			
					17
8.9	83.8	2.692			
					18
8.9	84.8	2.702			
					19
8.9	84.6	2.712			
					20
8.9	85.1	2.722			
					21
8.9	84.0	2.732			
					22

8.9	84.7	2.742	23
8.9	85.8	2.752	24
8.9	86.3	2.762	25
8.9	87.0	2.772	26
8.9	87.0	2.782	27
8.9	87.0	2.792	28
8.9	85.3	2.802	29
8.9	84.3	2.812	30
8.9	83.6	2.823	31
8.9	82.5	2.833	32
8.9	81.5	2.843	33
8.9	80.7	2.853	34
8.9	80.4	2.863	35
8.9	79.9	2.873	36
8.9	79.2	2.883	37
8.9	79.3	2.893	38
8.9	78.8	2.903	39
8.9	79.0	2.913	40
8.9	78.6	2.923	41
8.9	79.6	2.933	42
8.9	80.3	2.944	43
8.9	80.8	2.954	44
8.9	81.0	2.964	45
8.9	81.6	2.974	46
8.9	82.1	2.984	47
8.9	82.5	2.994	48

8.9	83.2	3.004	49
8.9	83.4	3.014	50
8.9	83.6	3.024	

OBS.WELL NO. X Y

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
	4	8 9	
.0	.0	.000	0
7.6	1.2	2.530	1
7.6	1.2	2.540	2
7.6	1.2	2.550	3
7.6	1.2	2.560	4
7.6	1.2	2.571	5
7.6	1.2	2.581	6
7.6	1.2	2.591	7
7.6	1.2	2.601	8
7.6	1.2	2.611	9
7.6	1.2	2.621	10
7.6	1.2	2.631	11
7.6	1.2	2.641	12
7.6	1.2	2.651	13
7.6	1.3	2.661	14
7.6	1.2	2.671	15
7.6	1.3	2.681	16
7.6	1.2	2.692	17
7.6	1.2	2.702	18
7.6	1.2	2.712	19
			20

7.6	1.3	2.722	21
7.6	1.3	2.732	22
7.6	1.3	2.742	23
7.6	1.3	2.752	24
7.6	1.3	2.762	25
7.6	1.3	2.772	26
7.6	1.3	2.782	27
7.6	1.3	2.792	28
7.6	1.3	2.802	29
7.6	1.3	2.812	30
7.6	1.4	2.823	31
7.6	1.4	2.833	32
7.6	1.4	2.843	33
7.6	1.4	2.853	34
7.6	1.4	2.863	35
7.6	1.4	2.873	36
7.6	1.4	2.883	37
7.6	1.3	2.893	38
7.6	1.4	2.903	39
7.6	1.4	2.913	40
7.6	1.4	2.923	41
7.6	1.4	2.933	42
7.6	1.4	2.944	43
7.6	1.3	2.954	44
7.6	1.3	2.964	45
7.6	1.3	2.974	46

7.6	1.3	2.984	47
7.6	1.3	2.994	48
7.6	1.3	3.004	49
7.6	1.3	3.014	50
7.6	1.3	3.024	

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .98617E+08
  CHEM.TIME(DAYS)    =   .11414E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .31250E+01
 NO. MOVES COMPLETED =   310
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	3	4	30	95	3	0	0
0	0	16	30	47	90	93	7	0	0
0	0	66	79	85	90	88	9	1	0
0	0	52	83	85	84	52	8	1	0
0	0	42	79	80	79	14	7	1	0
0	0	8	47	80	74	20	6	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .98617E+08
  CHEM.TIME(DAYS)    =   .11414E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .31250E+01
 NO. MOVES COMPLETED =   310
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	3	2	3	29	94	3	0	0
0	0	15	29	47	89	93	6	0	0
0	0	66	79	85	90	87	8	0	0
0	0	52	82	85	83	51	7	1	0
0	0	42	79	80	79	14	7	1	0
0	0	8	47	80	73	19	6	1	0

```
0     0     0     0     0     0     0     0     0     0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .10180E+09
   CHEM.TIME(DAYS)    =   .11782E+04
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .32258E+01
  NO. MOVES COMPLETED =   320

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     1     3     0     0     0
0     0     3     2     4    29    95     3     0     0
0     0    20    32    47    90    93    15     0     0
0     0    58    79    86    90    88     9     1     0
0     0    62    83    85    84    45     7     1     0
0     0    42    80    76    81    15     7     1     0
0     0     8    48    78    73    18     7     1     0
0     0     0     0     0     0     0     0     0     0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+ 9
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .10180E+09
   CHEM.TIME(DAYS)    =   .11782E+04
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .32258E+01
  NO. MOVES COMPLETED =   320

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     2     0     0     0
0     0     3     2     3    29    94     3     0     0
0     0    19    32    46    90    93    14     0     0
0     0    57    79    85    89    87     9     0     0
0     0    61    83    85    83    45     7     1     0
0     0    42    79    76    81    14     7     1     0
0     0     8    47    78    73    18     6     1     0
0     0     0     0     0     0     0     0     0     0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .10498E+09
   CHEM.TIME(DAYS)    =   .12150E+04
```

```
        TIME(YEARS)     =    .50000E+01
   CHEM.TIME(YEARS)     =    .33266E+01
  NO. MOVES COMPLETED =    330
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	3	4	28	95	3	0	0
0	0	18	30	47	90	93	7	0	0
0	0	62	80	86	90	88	9	1	0
0	0	62	82	85	84	45	7	1	0
0	0	46	81	80	81	15	7	1	0
0	0	8	51	78	75	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .10498E+09
   CHEM.TIME(DAYS)    =    .12150E+04
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .33266E+01
  NO. MOVES COMPLETED =    330
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	2	0	0	0
0	0	3	2	3	23	94	3	0	0
0	0	17	29	47	90	93	6	0	0
0	0	61	79	85	89	87	8	0	0
0	0	62	81	84	83	45	7	0	0
0	0	46	81	79	81	15	7	1	0
0	0	7	51	78	75	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .10816E+09
   CHEM.TIME(DAYS)    =    .12519E+04
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .34274E+01
  NO. MOVES COMPLETED =    340
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0

0	0	3	3	4	28	95	3	0	0
0	0	14	33	47	90	93	13	0	0
0	0	56	80	86	90	88	9	1	0
0	0	66	83	85	84	52	7	1	0
0	0	43	81	79	81	15	7	1	0
0	0	8	55	79	76	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .10816E+09
  CHEM.TIME(DAYS)    =   .12519E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .34274E+01
 NO. MOVES COMPLETED =   340
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	3	2	3	28	94	2	0	0
0	0	14	32	47	89	93	12	0	0
0	0	55	79	85	90	87	9	0	0
0	0	65	82	84	83	51	7	1	0
0	0	42	80	78	81	14	7	1	0
0	0	7	54	79	76	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .11134E+09
  CHEM.TIME(DAYS)    =   .12887E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .35282E+01
 NO. MOVES COMPLETED =   350
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	5	1	0	0
0	0	3	3	4	38	80	3	0	0
0	0	18	26	40	80	84	16	0	0
0	0	59	79	86	89	60	13	1	0
0	0	68	83	86	84	57	7	1	0
0	0	43	80	80	70	27	9	1	0
0	0	8	55	79	77	18	6	1	0
0	0	0	0	0	0	0	0	0	0

HEAD (FT)	CONC.(MG/L)	OBS.WELL NO. X Y TIME (YEARS)	N
		1 3 4	
.0	.0	.000	0
23.7	.1	3.034	1
23.7	.0	3.044	2
23.7	.0	3.054	3
23.7	.0	3.065	4
23.7	.1	3.075	5
23.7	.1	3.085	6
23.7	.1	3.095	7
23.7	.0	3.105	8
23.7	.0	3.115	9
23.7	.0	3.125	10
23.7	.1	3.135	11
23.7	.1	3.145	12
23.7	.0	3.155	13
23.7	.0	3.165	14
23.7	.0	3.175	15
23.7	.0	3.185	16
23.7	.0	3.196	17
23.7	.0	3.206	18
23.7	.0	3.216	19
23.7	.1	3.226	20
23.7	.1	3.236	21
23.7	.1	3.246	22

23.7	.1	3.256	23
23.7	.0	3.266	24
23.7	.1	3.276	25
23.7	.1	3.286	26
23.7	.0	3.296	27
23.7	.0	3.306	28
23.7	.0	3.317	29
23.7	.1	3.327	30
23.7	.1	3.337	31
23.7	.1	3.347	32
23.7	.1	3.357	33
23.7	.1	3.367	34
23.7	.1	3.377	35
23.7	.1	3.387	36
23.7	.1	3.397	37
23.7	.0	3.407	38
23.7	.0	3.417	39
23.7	.1	3.427	40
23.7	.1	3.437	41
23.7	.1	3.448	42
23.7	.1	3.458	43
23.7	.1	3.468	44
23.7	.1	3.478	45
23.7	.1	3.488	46
23.7	.0	3.498	47
23.7	.0	3.508	48

23.7	.0	3.518	49
23.7	.0	3.528	50

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	2	2 7	
.0	.0	.000	0
-4.1	62.1	3.034	1
-4.1	64.7	3.044	2
-4.1	64.5	3.054	3
-4.1	64.3	3.065	4
-4.1	64.1	3.075	5
-4.1	63.9	3.085	6
-4.1	63.7	3.095	7
-4.1	66.9	3.105	8
-4.1	66.7	3.115	9
-4.1	66.5	3.125	10
-4.1	64.8	3.135	11
-4.1	64.6	3.145	12
-4.1	66.8	3.155	13
-4.1	68.2	3.165	14
-4.1	67.9	3.175	15
-4.1	66.7	3.185	16
-4.1	66.5	3.196	17
-4.1	68.1	3.206	18
-4.1	67.9	3.216	19
-4.1	57.6	3.226	20

-4.1	57.5	3.236	21
-4.1	57.5	3.246	22
-4.1	54.7	3.256	23
-4.1	57.4	3.266	24
-4.1	59.4	3.276	25
-4.1	59.3	3.286	26
-4.1	59.6	3.296	27
-4.1	62.1	3.306	28
-4.1	62.0	3.317	29
-4.1	61.9	3.327	30
-4.1	59.7	3.337	31
-4.1	59.6	3.347	32
-4.1	62.1	3.357	33
-4.1	62.0	3.367	34
-4.1	59.6	3.377	35
-4.1	59.5	3.387	36
-4.1	55.9	3.397	37
-4.1	55.9	3.407	38
-4.1	55.8	3.417	39
-4.1	55.7	3.427	40
-4.1	55.7	3.437	41
-4.1	55.6	3.448	42
-4.1	55.6	3.458	43
-4.1	55.5	3.468	44
-4.1	55.5	3.478	45
-4.1	56.9	3.488	46

-4.1	58.8	3.498	47
-4.1	53.7	3.508	48
-4.1	59.1	3.518	49
-4.1	59.0	3.528	50

OBS.WELL NO. X Y

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
	3	5 8	
.0	.0	.000	0
8.9	84.0	3.034	1
8.9	84.1	3.044	2
8.9	84.1	3.054	3
8.9	84.1	3.065	4
8.9	84.2	3.075	5
8.9	84.1	3.085	6
8.9	84.0	3.095	7
8.9	83.8	3.105	8
8.9	83.7	3.115	9
8.9	83.7	3.125	10
8.9	83.7	3.135	11
8.9	83.6	3.145	12
8.9	83.6	3.155	13
8.9	83.6	3.165	14
8.9	83.7	3.175	15
8.9	83.7	3.185	16
8.9	83.8	3.196	17
8.9	83.9	3.206	18

8.9	83.9	3.216	19
8.9	84.0	3.226	20
8.9	84.1	3.236	21
8.9	84.1	3.246	22
8.9	84.1	3.256	23
8.9	84.1	3.266	24
8.9	84.1	3.276	25
8.9	84.1	3.286	26
8.9	84.0	3.296	27
8.9	84.0	3.306	28
8.9	84.0	3.317	29
8.9	83.9	3.327	30
8.9	83.9	3.337	31
8.9	83.9	3.347	32
8.9	83.9	3.357	33
8.9	83.9	3.367	34
8.9	83.9	3.377	35
8.9	83.9	3.387	36
8.9	83.9	3.397	37
8.9	83.9	3.407	38
8.9	84.0	3.417	39
8.9	84.0	3.427	40
8.9	83.9	3.437	41
8.9	83.9	3.448	42
8.9	85.4	3.458	43
8.9	84.1	3.468	44

8.9	81.8	3.478	45
8.9	82.3	3.488	46
8.9	83.0	3.498	47
8.9	84.4	3.508	48
8.9	84.4	3.518	49
8.9	84.0	3.528	50

OBS.WELL NO. X Y N

HEAD (FT) CONC.(MG/L) TIME (YEARS)

4 8 9

.0	.0	.000	0
7.6	1.3	3.034	1
7.6	1.3	3.044	2
7.6	1.3	3.054	3
7.6	1.2	3.065	4
7.6	1.3	3.075	5
7.6	1.3	3.085	6
7.6	1.3	3.095	7
7.6	1.3	3.105	8
7.6	1.3	3.115	9
7.6	1.3	3.125	10
7.6	1.3	3.135	11
7.6	1.3	3.145	12
7.6	1.3	3.155	13
7.6	1.3	3.165	14
7.6	1.3	3.175	15
7.6	1.3	3.185	16

7.6	1.3	3.196	17
7.6	1.2	3.206	18
7.6	1.2	3.216	19
7.6	1.3	3.226	20
7.6	1.3	3.236	21
7.6	1.2	3.246	22
7.6	1.2	3.256	23
7.6	1.2	3.266	24
7.6	1.2	3.276	25
7.6	1.2	3.286	26
7.6	1.2	3.296	27
7.6	1.2	3.306	28
7.6	1.2	3.317	29
7.6	1.2	3.327	30
7.6	1.2	3.337	31
7.6	1.2	3.347	32
7.6	1.2	3.357	33
7.6	1.2	3.367	34
7.6	1.2	3.377	35
7.6	1.2	3.387	36
7.6	1.2	3.397	37
7.6	1.2	3.407	38
7.6	1.2	3.417	39
7.6	1.2	3.427	40
7.6	1.2	3.437	41
7.6	1.2	3.448	42

7.6	1.2	3.458	43
7.6	1.2	3.468	44
7.6	1.2	3.478	45
7.6	1.2	3.488	46
7.6	1.2	3.498	47
7.6	1.2	3.508	48
7.6	1.3	3.518	49
7.6	1.2	3.528	50

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .11452E+09
  CHEM.TIME(DAYS)    =   .13255E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .36290E+01
 NO. MOVES COMPLETED =   360
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	34	94	3	0	0
0	0	18	30	42	88	92	6	1	0
0	0	65	78	80	82	80	9	1	0
0	0	62	84	88	87	46	10	1	0
0	0	48	80	82	75	39	7	1	0
0	0	8	58	79	71	21	8	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .11452E+09
  CHEM.TIME(DAYS)    =   .13255E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .36290E+01
 NO. MOVES COMPLETED =   360
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	3	0	0	0
0	0	3	2	3	33	94	3	0	0
0	0	18	29	41	87	91	6	0	0
0	0	65	77	80	81	80	8	0	0
0	0	61	84	87	86	46	9	1	0
0	0	48	79	82	74	38	6	1	0
0	0	7	58	79	71	21	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .11770E+09
  CHEM.TIME(DAYS)    =   .13623E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .37298E+01
 NO. MOVES COMPLETED =   370
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	37	95	3	0	0
0	0	18	33	36	90	93	16	0	0
0	0	67	79	81	88	75	9	1	0
0	0	63	84	87	80	52	7	1	0
0	0	52	80	84	80	17	8	1	0
0	0	7	58	80	70	31	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .11770E+09
  CHEM.TIME(DAYS)    =   .13623E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .37298E+01
 NO. MOVES COMPLETED =   370
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	3	2	3	37	94	3	0	0
0	0	17	33	36	89	92	16	0	0
0	0	67	78	80	88	74	9	0	0
0	0	63	84	86	79	51	7	1	0
0	0	52	80	83	79	16	7	1	0
0	0	7	58	79	69	31	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .12089E+09
  CHEM.TIME(DAYS)    =   .13991E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .38306E+01
 NO. MOVES COMPLETED =   380
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	31	95	3	0	0
0	0	23	31	45	90	93	6	0	0
0	0	68	77	84	89	88	8	1	0
0	0	62	85	84	82	61	8	1	0
0	0	53	81	83	80	17	6	1	0
0	0	7	59	80	72	25	3	2	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .12089E+09
  CHEM.TIME(DAYS)    =   .13991E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .38306E+01
 NO. MOVES COMPLETED =   380
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0
0	0	2	2	3	31	94	2	0	0
0	0	22	30	44	89	93	6	0	0
0	0	68	76	84	89	87	8	0	0
0	0	62	84	84	81	61	7	1	0
0	0	52	80	83	79	16	6	1	0
0	0	7	58	79	71	24	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .12407E+09
  CHEM.TIME(DAYS)    =   .14360E+04
       TIME(YEARS)   =   .50000E+01
```

```
   CHEM.TIME(YEARS)     =    .39314E+01
  NO. MOVES COMPLETED =    390

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    3    3    4   32   95    3    0    0
0    0   15   30   40   90   93   16    0    0
0    0   70   78   85   90   88    8    1    0
0    0   61   84   86   84   60    8    1    0
0    0   48   81   82   79   13    7    1    0
0    0    7   59   81   73   21    7    2    0
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .12407E+09
   CHEM.TIME(DAYS)    =    .14360E+04
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .39314E+01
  NO. MOVES COMPLETED =    390

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    3    0    0    0
0    0    3    2    3   32   94    2    0    0
0    0   14   30   40   90   93   15    0    0
0    0   69   77   84   89   88    8    0    0
0    0   60   84   85   84   59    7    1    0
0    0   47   80   82   78   13    6    1    0
0    0    7   58   80   73   21    6    1    0
0    0    0    0    0    0    0    0    0    0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =    .15779E+09
        TIME(SECONDS) =    .15779E+09
   CHEM.TIME(SECONDS) =    .12725E+09
   CHEM.TIME(DAYS)    =    .14728E+04
        TIME(YEARS)   =    .50000E+01
   CHEM.TIME(YEARS)   =    .40322E+01
  NO. MOVES COMPLETED =    400

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    3    2    4   37   95    3    0    0
```

0	0	13	37	36	90	94	7	0	0
0	0	72	79	85	90	88	9	1	0
0	0	62	84	85	84	51	8	1	0
0	0	48	80	78	80	15	7	1	0
0	0	12	59	80	73	19	7	1	0
0	0	0	0	0	0	0	0	0	0

OBS.WELL NO. X Y

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
	1	3 4	
.0	.0	.000	0
23.7	.0	3.538	1
23.7	.0	3.548	2
23.7	.0	3.558	3
23.7	.0	3.569	4
23.7	.0	3.579	5
23.7	.0	3.589	6
23.7	.1	3.599	7
23.7	.1	3.609	8
23.7	.1	3.619	9
23.7	.0	3.629	10
23.7	.1	3.639	11
23.7	.1	3.649	12
23.7	.0	3.659	13
23.7	.0	3.669	14
23.7	.0	3.679	15
23.7	.0	3.690	16
23.7	.0	3.700	17
23.7	.0	3.710	18
			19

23.7	.0	3.720	20
23.7	.1	3.730	21
23.7	.0	3.740	22
23.7	.0	3.750	23
23.7	.0	3.760	24
23.7	.0	3.770	25
23.7	.0	3.780	26
23.7	.0	3.790	27
23.7	.0	3.800	28
23.7	.0	3.810	29
23.7	.0	3.821	30
23.7	.0	3.831	31
23.7	.1	3.841	32
23.7	.0	3.851	33
23.7	.0	3.861	34
23.7	.0	3.871	35
23.7	.0	3.881	36
23.7	.1	3.891	37
23.7	.0	3.901	38
23.7	.0	3.911	39
23.7	.0	3.921	40
23.7	.1	3.931	41
23.7	.1	3.942	42
23.7	.1	3.952	43
23.7	.0	3.962	44
23.7	.0	3.972	45

23.7	.0	3.982	46
23.7	.1	3.992	47
23.7	.1	4.002	48
23.7	.1	4.012	49
23.7	.0	4.022	50
23.7	.0	4.032	

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
OBS.WELL NO.	X	Y	
2	2	7	
.0	.0	.000	0
-4.1	59.0	3.538	1
-4.1	60.9	3.548	2
-4.1	60.8	3.558	3
-4.1	61.4	3.569	4
-4.1	61.3	3.579	5
-4.1	62.1	3.589	6
-4.1	63.2	3.599	7
-4.1	63.1	3.609	8
-4.1	65.6	3.619	9
-4.1	65.4	3.629	10
-4.1	64.1	3.639	11
-4.1	64.0	3.649	12
-4.1	63.8	3.659	13
-4.1	65.0	3.669	14
-4.1	64.8	3.679	15
-4.1	65.9	3.690	16
			17

-4.1	67.2	3.700	18
-4.1	67.1	3.710	19
-4.1	67.5	3.720	20
-4.1	67.3	3.730	21
-4.1	67.2	3.740	22
-4.1	67.0	3.750	23
-4.1	65.4	3.760	24
-4.1	65.3	3.770	25
-4.1	65.1	3.780	26
-4.1	65.0	3.790	27
-4.1	64.8	3.800	28
-4.1	64.6	3.810	29
-4.1	68.7	3.821	30
-4.1	68.2	3.831	31
-4.1	68.0	3.841	32
-4.1	67.8	3.851	33
-4.1	67.7	3.861	34
-4.1	68.9	3.871	35
-4.1	68.7	3.881	36
-4.1	68.5	3.891	37
-4.1	70.2	3.901	38
-4.1	70.0	3.911	39
-4.1	69.8	3.921	40
-4.1	69.6	3.931	41
-4.1	69.4	3.942	42
-4.1	69.2	3.952	43

-4.1	71.5	3.962	44
-4.1	71.3	3.972	45
-4.1	71.1	3.982	46
-4.1	70.0	3.992	47
-4.1	69.8	4.002	48
-4.1	71.4	4.012	49
-4.1	72.2	4.022	50
-4.1	72.0	4.032	

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	3	5 8	
.0	.0	.000	0
8.9	83.7	3.538	1
8.9	84.0	3.548	2
8.9	85.0	3.558	3
8.9	84.8	3.569	4
8.9	85.0	3.579	5
8.9	84.8	3.589	6
8.9	84.6	3.599	7
8.9	85.7	3.609	8
8.9	86.3	3.619	9
8.9	87.0	3.629	10
8.9	87.0	3.639	11
8.9	87.0	3.649	12
8.9	85.3	3.659	13
8.9	84.3	3.669	14
			15

8.9	82.6	3.679	16
8.9	82.5	3.690	17
8.9	81.5	3.700	18
8.9	80.7	3.710	19
8.9	80.4	3.720	20
8.9	79.9	3.730	21
8.9	79.2	3.740	22
8.9	79.3	3.750	23
8.9	79.8	3.760	24
8.9	79.0	3.770	25
8.9	78.6	3.780	26
8.9	79.6	3.790	27
8.9	80.3	3.800	28
8.9	80.8	3.810	29
8.9	81.0	3.821	30
8.9	81.6	3.831	31
8.9	82.1	3.841	32
8.9	82.5	3.851	33
8.9	83.2	3.861	34
8.9	83.4	3.871	35
8.9	83.6	3.881	36
8.9	84.1	3.891	37
8.9	84.1	3.901	38
8.9	84.1	3.911	39
8.9	84.1	3.921	40
8.9	84.2	3.931	41

8.9	84.1	3.942	42
8.9	84.0	3.952	43
8.9	83.9	3.962	44
8.9	83.7	3.972	45
8.9	83.7	3.982	46
8.9	83.7	3.992	47
8.9	83.7	4.002	48
8.9	83.6	4.012	49
8.9	83.6	4.022	50
8.9	83.7	4.032	

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	4	8 9	
.0	.0	.000	0
7.6	1.3	3.538	1
7.6	1.2	3.548	2
7.6	1.2	3.558	3
7.6	1.2	3.569	4
7.6	1.3	3.579	5
7.6	1.3	3.589	6
7.6	1.3	3.599	7
7.6	1.3	3.609	8
7.6	1.3	3.619	9
7.6	1.3	3.629	10
7.6	1.3	3.639	11
7.6	1.3	3.649	12
			13

7.6	1.3	3.659	14
7.6	1.3	3.669	15
7.6	1.4	3.679	16
7.6	1.4	3.690	17
7.6	1.4	3.700	18
7.6	1.4	3.710	19
7.6	1.4	3.720	20
7.6	1.4	3.730	21
7.6	1.4	3.740	22
7.6	1.3	3.750	23
7.6	1.4	3.760	24
7.6	1.4	3.770	25
7.6	1.4	3.780	26
7.6	1.4	3.790	27
7.6	1.4	3.800	28
7.6	1.3	3.810	29
7.6	1.3	3.821	30
7.6	1.3	3.831	31
7.6	1.3	3.841	32
7.6	1.3	3.851	33
7.6	1.3	3.861	34
7.6	1.3	3.871	35
7.6	1.3	3.881	36
7.6	1.3	3.891	37
7.6	1.3	3.901	38
7.6	1.3	3.911	39

```
   7.6            1.2          3.921
                                                                    40
   7.6            1.3          3.931
                                                                    41
   7.6            1.3          3.942
                                                                    42
   7.6            1.3          3.952
                                                                    43
   7.6            1.3          3.962
                                                                    44
   7.6            1.3          3.972
                                                                    45
   7.6            1.3          3.982
                                                                    46
   7.6            1.3          3.992
                                                                    47
   7.6            1.3          4.002
                                                                    48
   7.6            1.3          4.012
                                                                    49
   7.6            1.3          4.022
                                                                    50
   7.6            1.3          4.032
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .13043E+09
   CHEM.TIME(DAYS)    =   .15096E+04
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .41331E+01
  NO. MOVES COMPLETED =   410

0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    1    3    0    0    0
0    0    3    3    4   31   95    9    0    0
0    0   13   30   45   90   93    7    0    0
0    0   65   80   86   90   88    8    1    0
0    0   68   83   85   84   48    7    1    0
0    0   51   82   80   81   15    7    1    0
0    0   12   61   77   75   18    7    1    0
0    0    0    0    0    0    0    0    0    0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .13043E+09
   CHEM.TIME(DAYS)    =   .15096E+04
```

```
          TIME(YEARS)     =    .50000E+01
    CHEM.TIME(YEARS)      =    .41331E+01
   NO. MOVES COMPLETED =    410

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     3     0     0     0
0     0     3     2     3    30    94     9     0     0
0     0    12    30    45    89    93     6     0     0
0     0    65    79    85    90    87     8     0     0
0     0    67    82    85    84    48     7     1     0
0     0    51    81    79    81    15     7     1     0
0     0    11    61    77    74    17     6     1     0
0     0     0     0     0     0     0     0     0     0
 CONCENTRATION

 NUMBER OF TIME STEPS =      1
          DELTA T         =    .15779E+09
          TIME(SECONDS)   =    .15779E+09
    CHEM.TIME(SECONDS)    =    .13361E+09
    CHEM.TIME(DAYS)       =    .15464E+04
          TIME(YEARS)     =    .50000E+01
    CHEM.TIME(YEARS)      =    .42339E+01
   NO. MOVES COMPLETED =    420

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     1     3     0     0     0
0     0     3     2     4    34    95     3     0     0
0     0    20    34    38    90    93    15     0     0
0     0    65    80    86    90    88     8     1     0
0     0    67    84    85    84    51     8     1     0
0     0    52    82    79    82    16     7     1     0
0     0    12    62    79    76    18     7     1     0
0     0     0     0     0     0     0     0     0     0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =      1
          DELTA T         =    .15779E+09
          TIME(SECONDS)   =    .15779E+09
    CHEM.TIME(SECONDS)    =    .13361E+09
    CHEM.TIME(DAYS)       =    .15464E+04
          TIME(YEARS)     =    .50000E+01
    CHEM.TIME(YEARS)      =    .42339E+01
   NO. MOVES COMPLETED =    420

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     3     0     0     0
```

0	0	3	2	3	33	94	3	0	0
0	0	19	33	38	90	93	15	0	0
0	0	64	79	85	89	87	8	0	0
0	0	67	83	84	83	51	7	0	0
0	0	51	82	79	81	15	7	1	0
0	0	11	61	79	75	18	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .13679E+09
  CHEM.TIME(DAYS)    =   .15832E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .43347E+01
 NO. MOVES COMPLETED =   430
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	4	0	0	0
0	0	2	2	5	44	87	3	0	0
0	0	21	26	53	82	85	8	0	0
0	0	61	80	86	90	88	13	1	0
0	0	70	83	85	82	64	9	1	0
0	0	49	82	79	81	27	7	1	0
0	0	11	64	79	77	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .13679E+09
  CHEM.TIME(DAYS)    =   .15832E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .43347E+01
 NO. MOVES COMPLETED =   430
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	1	4	43	86	3	0	0
0	0	20	26	53	81	85	8	0	0
0	0	61	79	85	89	87	13	0	0
0	0	69	83	85	81	64	9	1	0
0	0	48	81	79	81	27	7	1	0
0	0	11	64	79	77	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .13997E+09
  CHEM.TIME(DAYS)    =   .16201E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .44355E+01
 NO. MOVES COMPLETED =   440
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	2	3	0	0	0
0	0	3	2	5	30	93	3	0	0
0	0	21	28	53	84	87	25	1	0
0	0	65	80	82	83	68	10	1	0
0	0	68	84	88	85	51	12	1	0
0	0	53	81	82	76	39	8	1	0
0	0	11	64	78	71	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .13997E+09
  CHEM.TIME(DAYS)    =   .16201E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .44355E+01
 NO. MOVES COMPLETED =   440
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	2	2	4	29	93	3	0	0
0	0	20	27	53	83	86	25	0	0
0	0	65	79	82	82	67	10	0	0
0	0	67	84	87	85	51	11	1	0
0	0	53	81	81	75	38	8	1	0
0	0	11	64	78	70	17	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .14315E+09
  CHEM.TIME(DAYS)    =   .16569E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .45363E+01
```

NO. MOVES COMPLETED = 450

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	28	95	3	0	0
0	0	14	25	46	89	93	7	1	0
0	0	68	77	80	86	78	8	1	0
0	0	67	85	87	83	43	8	1	0
0	0	54	81	83	77	29	7	1	0
0	0	11	66	79	72	26	7	1	0
0	0	0	0	0	0	0	0	0	0

OBS.WELL NO. X Y

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
	1	3 4	
.0	.0	.000	0
23.7	.0	4.042	1
23.7	.0	4.052	2
23.7	.0	4.062	3
23.7	.0	4.073	4
23.7	.1	4.083	5
23.7	.1	4.093	6
23.7	.1	4.103	7
23.7	.1	4.113	8
23.7	.0	4.123	9
23.7	.1	4.133	10
23.7	.1	4.143	11
23.7	.0	4.153	12
23.7	.0	4.163	13
23.7	.0	4.173	14
23.7	.1	4.183	15

23.7	.1	4.194	16
23.7	.1	4.204	17
23.7	.1	4.214	18
23.7	.1	4.224	19
23.7	.1	4.234	20
23.7	.1	4.244	21
23.7	.1	4.254	22
23.7	.1	4.264	23
23.7	.0	4.274	24
23.7	.1	4.284	25
23.7	.1	4.294	26
23.7	.1	4.304	27
23.7	.1	4.315	28
23.7	.1	4.325	29
23.7	.1	4.335	30
23.7	.1	4.345	31
23.7	.0	4.355	32
23.7	.0	4.365	33
23.7	.0	4.375	34
23.7	.0	4.385	35
23.7	.0	4.395	36
23.7	.0	4.405	37
23.7	.0	4.415	38
23.7	.0	4.425	39
23.7	.0	4.435	40
23.7	.1	4.446	41

23.7	.1	4.456	42
23.7	.1	4.466	43
23.7	.1	4.476	44
23.7	.1	4.486	45
23.7	.1	4.496	46
23.7	.1	4.506	47
23.7	.1	4.516	48
23.7	.0	4.526	49
23.7	.0	4.536	50

OBS.WELL NO. X Y N

2 2 7

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
.0	.0	.000	0
-4.1	71.1	4.042	1
-4.1	70.9	4.052	2
-4.1	72.0	4.062	3
-4.1	71.7	4.073	4
-4.1	63.9	4.083	5
-4.1	63.8	4.093	6
-4.1	63.7	4.103	7
-4.1	61.5	4.113	8
-4.1	63.5	4.123	9
-4.1	65.0	4.133	10
-4.1	64.9	4.143	11
-4.1	64.7	4.153	12
-4.1	66.7	4.163	13

-4.1	66.5	4.173	14
-4.1	66.4	4.183	15
-4.1	64.8	4.194	16
-4.1	64.7	4.204	17
-4.1	66.7	4.214	18
-4.1	66.5	4.224	19
-4.1	64.7	4.234	20
-4.1	64.5	4.244	21
-4.1	61.8	4.254	22
-4.1	61.7	4.264	23
-4.1	61.6	4.274	24
-4.1	61.5	4.284	25
-4.1	61.4	4.294	26
-4.1	61.3	4.304	27
-4.1	61.2	4.315	28
-4.1	61.1	4.325	29
-4.1	61.0	4.335	30
-4.1	62.2	4.345	31
-4.1	63.8	4.355	32
-4.1	63.7	4.365	33
-4.1	64.0	4.375	34
-4.1	63.9	4.385	35
-4.1	63.7	4.395	36
-4.1	65.2	4.405	37
-4.1	65.1	4.415	38
-4.1	65.6	4.425	39

-4.1	65.4	4.435	40
-4.1	66.1	4.446	41
-4.1	67.0	4.456	42
-4.1	68.8	4.466	43
-4.1	68.9	4.476	44
-4.1	68.8	4.486	45
-4.1	67.9	4.496	46
-4.1	67.7	4.506	47
-4.1	67.5	4.516	48
-4.1	68.4	4.526	49
-4.1	68.2	4.536	50

HEAD (FT)	CONC.(MG/L)	OBS.WELL NO. TIME (YEARS)	X	Y	N
		3	5	8	
.0	.0	.000			0
8.9	83.7	4.042			1
8.9	83.9	4.052			2
8.9	83.9	4.062			3
8.9	83.9	4.073			4
8.9	84.0	4.083			5
8.9	84.1	4.093			6
8.9	84.1	4.103			7
8.9	84.1	4.113			8
8.9	84.1	4.123			9
8.9	84.1	4.133			10
8.9	84.1	4.143			11

8.9	84.1	4.153	12
8.9	84.0	4.163	13
8.9	84.0	4.173	14
8.9	83.9	4.183	15
8.9	83.9	4.194	16
8.9	83.9	4.204	17
8.9	83.9	4.214	18
8.9	83.9	4.224	19
8.9	83.9	4.234	20
8.9	83.9	4.244	21
8.9	83.9	4.254	22
8.9	83.9	4.264	23
8.9	84.0	4.274	24
8.9	84.0	4.284	25
8.9	83.9	4.294	26
8.9	83.9	4.304	27
8.9	85.5	4.315	28
8.9	84.1	4.325	29
8.9	81.8	4.335	30
8.9	82.3	4.345	31
8.9	83.0	4.355	32
8.9	84.4	4.365	33
8.9	84.4	4.375	34
8.9	84.0	4.385	35
8.9	83.7	4.395	36
8.9	84.0	4.405	37

8.9	85.1	4.415	38
8.9	84.9	4.425	39
8.9	85.0	4.435	40
8.9	84.8	4.446	41
8.9	84.6	4.456	42
8.9	85.8	4.466	43
8.9	86.3	4.476	44
8.9	87.0	4.486	45
8.9	87.0	4.496	46
8.9	87.0	4.506	47
8.9	85.3	4.516	48
8.9	84.3	4.526	49
8.9	82.6	4.536	50

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	4	8 9	
.0	.0	.000	0
7.6	1.3	4.042	1
7.6	1.3	4.052	2
7.6	1.2	4.062	3
7.6	1.2	4.073	4
7.6	1.3	4.083	5
7.6	1.3	4.093	6
7.6	1.2	4.103	7
7.6	1.2	4.113	8
7.6	1.2	4.123	9

7.6	1.2	4.133	10
7.6	1.2	4.143	11
7.6	1.2	4.153	12
7.6	1.2	4.163	13
7.6	1.2	4.173	14
7.6	1.2	4.183	15
7.6	1.2	4.194	16
7.6	1.2	4.204	17
7.6	1.2	4.214	18
7.6	1.2	4.224	19
7.6	1.2	4.234	20
7.6	1.2	4.244	21
7.6	1.2	4.254	22
7.6	1.2	4.264	23
7.6	1.2	4.274	24
7.6	1.2	4.284	25
7.6	1.2	4.294	26
7.6	1.2	4.304	27
7.6	1.2	4.315	28
7.6	1.2	4.325	29
7.6	1.2	4.335	30
7.6	1.2	4.345	31
7.6	1.2	4.355	32
7.6	1.2	4.365	33
7.6	1.3	4.375	34
7.6	1.2	4.385	35

7.6	1.3	4.395	36
7.6	1.2	4.405	37
7.6	1.2	4.415	38
7.6	1.2	4.425	39
7.6	1.3	4.435	40
7.6	1.3	4.446	41
7.6	1.3	4.456	42
7.6	1.3	4.466	43
7.6	1.3	4.476	44
7.6	1.3	4.486	45
7.6	1.3	4.496	46
7.6	1.3	4.506	47
7.6	1.3	4.516	48
7.6	1.3	4.526	49
7.6	1.4	4.536	50

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .14634E+09
  CHEM.TIME(DAYS)    =   .16937E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .46371E+01
 NO. MOVES COMPLETED =   460
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	3	29	95	9	0	0
0	0	12	21	46	90	93	7	0	0
0	0	68	78	83	88	83	8	1	0
0	0	70	85	86	79	58	7	1	0
0	0	57	81	83	83	18	8	1	0
0	0	11	66	79	71	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .14634E+09
  CHEM.TIME(DAYS)    =   .16937E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .46371E+01
 NO. MOVES COMPLETED =   460
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	3	2	3	29	94	9	0	0
0	0	12	20	46	89	92	7	0	0
0	0	68	77	83	88	82	8	0	0
0	0	69	85	85	78	57	7	1	0
0	0	56	81	83	83	17	7	1	0
0	0	10	66	79	71	26	7	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .14952E+09
  CHEM.TIME(DAYS)    =   .17305E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .47379E+01
 NO. MOVES COMPLETED =   470
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	3	30	95	3	0	0
0	0	17	32	47	90	93	14	0	0
0	0	71	77	84	89	88	9	1	0
0	0	68	84	86	84	51	7	1	0
0	0	51	82	82	78	14	6	1	0
0	0	10	67	80	73	23	7	2	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .14952E+09
  CHEM.TIME(DAYS)    =   .17305E+04
       TIME(YEARS)   =   .50000E+01
```

```
   CHEM.TIME(YEARS)    =   .47379E+01
  NO. MOVES COMPLETED =   470

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     1     2     0     0     0
0     0     3     2     3    29    94     3     0     0
0     0    16    31    47    89    93    13     0     0
0     0    71    76    84    89    87     8     0     0
0     0    68    84    85    83    50     7     1     0
0     0    50    82    82    78    14     6     1     0
0     0    10    66    79    73    23     7     1     0
0     0     0     0     0     0     0     0     0     0
 CONCENTRATION

 NUMBER OF TIME STEPS =     1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .15270E+09
   CHEM.TIME(DAYS)    =   .17673E+04
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .48387E+01
  NO. MOVES COMPLETED =   480

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     1     3     0     0     0
0     0     3     3     4    30    95     3     0     0
0     0    18    30    47    90    93     7     0     0
0     0    73    79    85    90    88     9     1     0
0     0    63    83    86    84    52     8     1     0
0     0    51    82    80    79    14     7     1     0
0     0    16    67    81    74    20     6     1     0
0     0     0     0     0     0     0     0     0     0
 CHANGE IN CONCENTRATION

 NUMBER OF TIME STEPS =     1
        DELTA T       =   .15779E+09
        TIME(SECONDS) =   .15779E+09
   CHEM.TIME(SECONDS) =   .15270E+09
   CHEM.TIME(DAYS)    =   .17673E+04
        TIME(YEARS)   =   .50000E+01
   CHEM.TIME(YEARS)   =   .48387E+01
  NO. MOVES COMPLETED =   480

0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     0     0     0     0
0     0     0     0     0     0     2     0     0     0
0     0     3     2     3    29    94     3     0     0
```

0	0	18	29	47	89	93	6	0	0
0	0	73	79	85	90	87	8	0	0
0	0	62	83	85	83	51	7	1	0
0	0	51	81	80	79	14	7	1	0
0	0	15	66	80	73	19	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .15588E+09
  CHEM.TIME(DAYS)    =   .18042E+04
        TIME(YEARS)  =   .50000E+01
  CHEM.TIME(YEARS)   =   .49395E+01
 NO. MOVES COMPLETED =   490
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	3	4	29	95	3	0	0
0	0	21	33	47	90	93	15	0	0
0	0	67	79	86	90	88	9	1	0
0	0	69	84	85	84	45	7	1	0
0	0	51	82	76	81	15	7	1	0
0	0	15	67	78	73	18	7	1	0
0	0	0	0	0	0	0	0	0	0

CHANGE IN CONCENTRATION

```
NUMBER OF TIME STEPS =      1
        DELTA T      =   .15779E+09
        TIME(SECONDS) =  .15779E+09
  CHEM.TIME(SECONDS) =   .15588E+09
  CHEM.TIME(DAYS)    =   .18042E+04
        TIME(YEARS)  =   .50000E+01
  CHEM.TIME(YEARS)   =   .49395E+01
 NO. MOVES COMPLETED =   490
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	2	0	0	0
0	0	3	2	3	29	94	3	0	0
0	0	20	32	46	90	93	14	0	0
0	0	66	79	85	89	87	9	0	0
0	0	69	83	85	83	45	7	1	0
0	0	51	81	76	81	14	7	1	0
0	0	15	67	78	73	18	6	1	0
0	0	0	0	0	0	0	0	0	0

CONCENTRATION

```
NUMBER OF TIME STEPS =      1
       DELTA T       =   .15779E+09
       TIME(SECONDS) =   .15779E+09
  CHEM.TIME(SECONDS) =   .15779E+09
  CHEM.TIME(DAYS)    =   .18263E+04
       TIME(YEARS)   =   .50000E+01
  CHEM.TIME(YEARS)   =   .50000E+01
 NO. MOVES COMPLETED =   496
```

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	0	0	0
0	0	3	2	4	29	95	3	0	0
0	0	12	23	52	90	93	14	0	0
0	0	67	80	86	90	88	9	1	0
0	0	70	83	85	84	52	7	1	0
0	0	55	82	80	81	15	7	1	0
0	0	15	68	78	75	18	7	1	0
0	0	0	0	0	0	0	0	0	0

HEAD (FT)	CONC.(MG/L)	OBS.WELL NO. X Y TIME (YEARS)	N
		1 3 4	
.0	.0	.000	0
23.7	.1	4.546	1
23.7	.0	4.556	2
23.7	.0	4.567	3
23.7	.0	4.577	4
23.7	.1	4.587	5
23.7	.0	4.597	6
23.7	.0	4.607	7
23.7	.0	4.617	8
23.7	.0	4.627	9
23.7	.0	4.637	10
23.7	.0	4.647	11
			12

23.7	.0	4.657	13
23.7	.0	4.667	14
23.7	.0	4.677	15
23.7	.0	4.687	16
23.7	.1	4.698	17
23.7	.1	4.708	18
23.7	.0	4.718	19
23.7	.0	4.728	20
23.7	.0	4.738	21
23.7	.1	4.748	22
23.7	.0	4.758	23
23.7	.0	4.768	24
23.7	.0	4.778	25
23.7	.1	4.788	26
23.7	.1	4.798	27
23.7	.1	4.808	28
23.7	.0	4.819	29
23.7	.0	4.829	30
23.7	.0	4.839	31
23.7	.1	4.849	32
23.7	.1	4.859	33
23.7	.1	4.869	34
23.7	.0	4.879	35
23.7	.0	4.889	36
23.7	.0	4.899	37
23.7	.0	4.909	38

23.7	.0	4.919	39
23.7	.0	4.929	40
23.7	.1	4.940	41
23.7	.1	4.950	42
23.7	.1	4.960	43
23.7	.1	4.970	44
23.7	.0	4.980	45
23.7	.1	4.990	46
23.7	.1	5.000	

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
OBS.WELL NO.	X	Y	
2	2	7	
.0	.0	.000	0
-4.1	69.1	4.546	1
-4.1	70.2	4.556	2
-4.1	70.0	4.567	3
-4.1	70.4	4.577	4
-4.1	70.2	4.587	5
-4.1	70.0	4.597	6
-4.1	69.8	4.607	7
-4.1	68.6	4.617	8
-4.1	68.4	4.627	9
-4.1	68.3	4.637	10
-4.1	68.1	4.647	11
-4.1	67.9	4.657	12
-4.1	67.7	4.667	13
			14

-4.1	71.6	4.677	15
-4.1	71.2	4.687	16
-4.1	71.0	4.698	17
-4.1	70.8	4.708	18
-4.1	70.6	4.718	19
-4.1	71.6	4.728	20
-4.1	71.4	4.738	21
-4.1	71.2	4.748	22
-4.1	72.6	4.758	23
-4.1	72.4	4.768	24
-4.1	72.1	4.778	25
-4.1	71.9	4.788	26
-4.1	71.7	4.798	27
-4.1	71.5	4.808	28
-4.1	73.5	4.819	29
-4.1	73.3	4.829	30
-4.1	73.0	4.839	31
-4.1	72.2	4.849	32
-4.1	72.0	4.859	33
-4.1	73.2	4.869	34
-4.1	73.9	4.879	35
-4.1	73.6	4.889	36
-4.1	72.9	4.899	37
-4.1	72.7	4.909	38
-4.1	73.5	4.919	39
-4.1	73.3	4.929	40

-4.1	66.6	4.940	41
-4.1	66.5	4.950	42
-4.1	66.4	4.960	43
-4.1	64.5	4.970	44
-4.1	66.2	4.980	45
-4.1	67.4	4.990	46
-4.1	67.3	5.000	

OBS.WELL NO. X Y N

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	
	3	5 8	
.0	.0	.000	0
8.9	82.5	4.546	1
8.9	81.5	4.556	2
8.9	80.7	4.567	3
8.9	80.4	4.577	4
8.9	79.9	4.587	5
8.9	79.2	4.597	6
8.9	79.3	4.607	7
8.9	78.8	4.617	8
8.9	79.0	4.627	9
8.9	78.6	4.637	10
8.9	79.7	4.647	11
8.9	80.3	4.657	12
8.9	80.8	4.667	13
8.9	81.0	4.677	14
8.9	81.6	4.687	15
			16

8.9	82.1	4.698	17
8.9	82.5	4.708	18
8.9	83.2	4.718	19
8.9	83.4	4.728	20
8.9	83.6	4.738	21
8.9	84.1	4.748	22
8.9	84.1	4.758	23
8.9	84.1	4.768	24
8.9	84.1	4.778	25
8.9	84.2	4.788	26
8.9	84.1	4.798	27
8.9	84.0	4.808	28
8.9	83.9	4.819	29
8.9	83.8	4.829	30
8.9	83.7	4.839	31
8.9	83.7	4.849	32
8.9	83.7	4.859	33
8.9	83.6	4.869	34
8.9	83.6	4.879	35
8.9	83.7	4.889	36
8.9	83.7	4.899	37
8.9	83.9	4.909	38
8.9	83.9	4.919	39
8.9	83.9	4.929	40
8.9	84.0	4.940	41
8.9	84.1	4.950	42

8.9	84.1	4.960	43
8.9	84.1	4.970	44
8.9	84.1	4.980	45
8.9	84.1	4.990	46
8.9	84.1	5.000	

OBS.WELL NO. X Y

HEAD (FT)	CONC.(MG/L)	TIME (YEARS)	N
	4	8 9	
.0	.0	.000	0
7.6	1.4	4.546	1
7.6	1.4	4.556	2
7.6	1.4	4.567	3
7.6	1.4	4.577	4
7.6	1.4	4.587	5
7.6	1.4	4.597	6
7.6	1.3	4.607	7
7.6	1.4	4.617	8
7.6	1.4	4.627	9
7.6	1.4	4.637	10
7.6	1.4	4.647	11
7.6	1.4	4.657	12
7.6	1.3	4.667	13
7.6	1.3	4.677	14
7.6	1.3	4.687	15
7.6	1.3	4.698	16
7.6	1.3	4.708	17
			18

7.6	1.3	4.718	19
7.6	1.3	4.728	20
7.6	1.3	4.738	21
7.6	1.3	4.748	22
7.6	1.3	4.758	23
7.6	1.3	4.768	24
7.6	1.2	4.778	25
7.6	1.3	4.788	26
7.6	1.3	4.798	27
7.6	1.3	4.808	28
7.6	1.3	4.819	29
7.6	1.3	4.829	30
7.6	1.3	4.839	31
7.6	1.3	4.849	32
7.6	1.3	4.859	33
7.6	1.3	4.869	34
7.6	1.3	4.879	35
7.6	1.3	4.889	36
7.6	1.3	4.899	37
7.6	1.3	4.909	38
7.6	1.2	4.919	39
7.6	1.2	4.929	40
7.6	1.3	4.940	41
7.6	1.3	4.950	42
7.6	1.2	4.960	43
7.6	1.2	4.970	44

7.6	1.2	4.980	
7.6	1.2	4.990	45
7.6	1.2	5.000	46