

LUPIN MINE, NUNAVUT  
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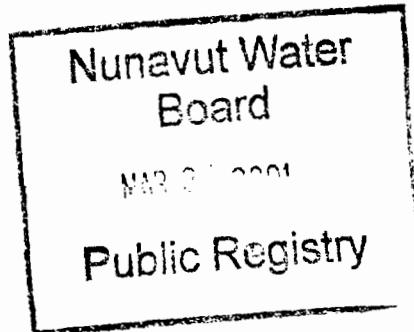
9818 INTERNATIONAL AIRPORT  
EDMONTON, ALBERTA  
T5J 2T2

## ECHO BAY MINES LTD.

March 15, 2001

Our File: NWB1LUP0008-Monthly01  
Your File: Water Register  
NWB1LUP0008

Executive Director  
Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NU  
X0B 1J0



Dear Sir:

**RE: Echo Bay Mines Ltd., Lupin Gold Mine, Contwoyto Lake, NT.; Water Licence  
NWB1LUP0008; Tailings Containment Area Management Report**

As required by Part A, Conditions Applying to Studies, Item 1 of Water Licence  
NWB1LUP0008, please find attached three copies of our document entitled "Tailings  
Containment Area Management Report for the Lupin Mine, Nunavut".

This report discusses the Tailings Management Plan for the term of the Licence with regard to  
the life of mine plan, tailings containment capacity and any expected future modifications  
required to sustain the Lupin Mine through to closure. A model spreadsheet is included which  
contains the planned production and waste discharge quantities from the Lupin mill as well as  
ongoing storage availability within the TCA. Actual production figures have been incorporated  
into the spreadsheet which include up to the accounting month of February.

Should you have any questions or comments regarding this report, please feel free to contact  
the undersigned at (780) 890-8794, Lupin.

Yours truly,

D. Hohnstein  
Environmental Coordinator, Lupin

Attach.

cc B. Danyluk  
H. Ducasse  
M. Tansey (Engineering)  
Mill Operations



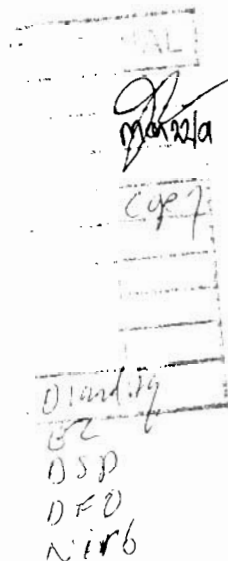
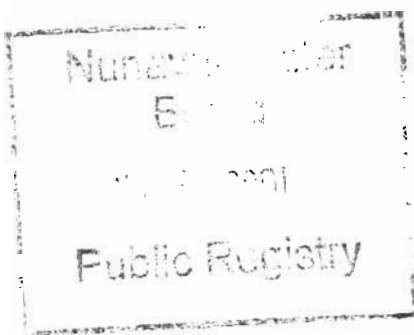
**ECHO BAY MINES LTD.**

**WATER LICENCE NWB1LUP0008**

**TAILINGS CONTAINMENT AREA  
MANAGEMENT REPORT**

**FOR THE**

**LUPIN MINE, NUNAVUT**



**Prepared - March 2001**

# Lupin Mine

## Tailings Containment Area Management Report

### Executive Summary

The Lupin Mine, owned and operated by Echo Bay Mines Ltd. was granted a renewal of the mine's Water Licence on July 1, 2000. This Licence has an expiry date of June 30, 2008. There is a current mine life of approximately eight years with production to decrease in the final two years and cease in April 2008.

The Tailings Containment Area has recently (August 2000) been upgraded with the addition of a lift on the internal dyke referred to as Mdam which encloses Cell No.5. This has provided an additional 1.25 million m<sup>3</sup> of storage space, bringing the total storage available for use in all areas to approximately 2,350,110 m<sup>3</sup> as of the end of August 2000.

The planned mine production schedule includes a throughput of 4,340,222 dry short tons between January 1, 2001 and April 30, 2008 utilizing approximately 84% of the current TCA solids storage capacity (Cells 2,3 and 5). This planned usage includes the historical ability of the mine to accept approximately 35% of the tailings produced by the mill as paste fill back in the underground.

With the current mine plan and the storage availability at the TCA, there are no immediate plans for modifications to increase capacity. Annual surveys and calculation reviews with the actual production figures will keep the engineering team informed of any future need for upgrading the TCA with regard to storage requirements. Should the need arise, several options are available. The first option would be to increase the height of Mdam to a maximum planned elevation of 490m. An alternate second choice would be either the use of Cell No.4 and construction of the divider dyke or that of increasing the maximum height of Cell No.3 dams. A final option of utilizing the End Lake areas would be a choice only once the more environmentally/economical options have been exhausted.

In November 2000, BGC Engineering Inc. proceeded with a program to replace failed thermistors within the perimeter dams and esker covered tailings. There were only six out of 9 thermistors installed due to poor drilling conditions (ground not frozen). Installation of the remaining thermistors is to be completed in early spring with the more competent ground conditions. These thermistors and their data will provide the base information for carrying out further studies regarding closure plans and the potential long term thermal effects upon the perimeter dams and covered tailings cells.

# **Lupin Mine Tailings Containment Area Management Report**

## **INTRODUCTION**

The Lupin Mine, owned and operated by Echo Bay Mines Ltd. applied for and was granted a renewal of the site Water Licence on July 1, 2000. This Licence has a current expiry date of June 30, 2008. Within Part G: Conditions Applying to Studies, under Item 1, there is a requirement to submit for approval by the Board, a "Tailings Containment Area Management Report". This report has been prepared to fulfil this requirement of the Licence and provide the Board with information regarding the capacity of the tailings containment, planned production at the Lupin Mine, utilization of the facility, any need for modifications and the rationale as well other issues required by this section of the Licence or as requested by the Board following an annual review.

## **BACKGROUND**

The milling process used to recover the gold from the ore at Lupin results in a waste material referred to as tailings. This is the end result of a process that involves crushing and grinding of the ore, pre-aeration and addition of lead nitrate to reduce overall chemical consumption and improve gold recovery, leaching with a cyanide solution and aeration, filtration to remove the solids component from the gold bearing solution and final recovery using the Merrill-Crowe process involving the precipitation of gold using zinc under oxygen deficient conditions. The remaining solids and "barren" solution (being barren of gold) are combined and pumped to the Tailings Containment Area (TCA) for deposition and holding for treatment prior to release of water to the environment.

The Lupin Mine has been in operation since 1982, utilizing the Tailings Containment Area that was initially designed for a 5 year production life and total containment. The TCA has evolved considerably since this initial design and is now configured with five main solids deposition cells (two of which have been filled) and two main water storage ponds to provide treatment and holding time prior to release of water to the environment. The system takes advantage of the natural degradation occurring within the cells and Pond No.1 and supplements that process when needed with the addition of an iron salt for arsenic removal and lime for pH control, thereby meeting Water Licence effluent quality limits prior to release. (Please see drawing "Lupin Mine - Tailings Area, enclosed).

Recent construction work during the summer of 2000 had been completed within the Lupin TCA which has provided an additional 1.25 million cubic metres of storage space for Cell No.5, bringing the total available storage for Cells 2,3 and 5 to approximately 2,350,110 cubic metres at the end of August, 2000. The internal divider dyke referred to as "Mdam" was raised to a

minimum elevation of 488.5m. There is still the potential for an additional increase in the elevation of Mdam to a maximum of 490m (the height of existing elevation of the adjoining Cell No.2) thereby providing additional storage without increasing the footprint of the TCA cells.

## **TAILINGS CONTAINMENT AREA UTILIZATION**

The mill tailings is deposited at the TCA year round and must be managed in such a way to maximize the volume available at the facility. This is accomplished by rotating deposition of tailings between at least two of the cells during winter/summer. By rotating and keeping the deposition of material thin during the winter months, summer thaw is allowed to penetrate and remove a considerable portion of the solution from the solids. Even with this method, the settled tailings retains approximately 25-30% of the original solution when settled. Without rotating the deposition of tailings and maintaining active areas to a depth less than the annual thaw, all solution that accompanies the tailings solids would be retained (frozen). This would ultimately consume storage volume much more rapidly and decrease the useable life of the current facility.

Decanted tailings solution is removed from the cells by either pumping or gravity flow through Cell No.4 and Pond No.1. Water removal is usually completed during the summer months from approximately mid-June through to early September. The larger capacity cell, currently Cell No.5, is used for winter tailings storage and is pumped free of water as late into the year as possible in an attempt to reduce any ice lense formation that might not thaw during the following season.

A spreadsheet prepared by the Lupin Engineering Department is included with this report which provides a detailed planned mine and milling production schedule along with the estimated volumes of solids and liquid wastes to be deposited within the TCA. The volumes being transported to the TCA for storage are based on historical paste backfill successes which reduce the volume of mill tailings sent to the TCA by approximately 35%.

## **PLANNED PRODUCTION AND TAILINGS DEPOSITION**

The planned production is based on a re-engineering study completed during care and maintenance (1998-2000) and using the current reserve estimates. For the purpose of mine planning, the reserve estimates (mill startup April 2000) have included the proven and probable reserve of 2,018,000 tons, inferred resource of 685,000 tons and the remaining 1.5 million tons of other resource based on drilling information to date and experience with the Lupin ore body.

The actual planned tonnage that will require disposal at the TCA will be reduced by approximately 35% through the use of solids in the paste backfill process. This could amount to

a mine life volume savings of approximately 990,500 m<sup>3</sup> when taking into account both the solids and the potential retained water content. The decanted water volume amount would increase as there would be less solids to retain the water.

As of January 2001, the mining and milling Life Of Mine Plan for the Lupin Mine will see a throughput of 4,340,222 dry short tons, utilizing an available storage at the TCA of 2,121,806 cubic metres. Approximately 333,192 cubic metres of storage will remain at the completion of mining in April 2008, prior to removing the water portion from the cells.

### **TCA STORAGE CAPACITY**

The spreadsheet contains, in detail, the expected monthly production figures from the mine and mill. It has been updated to include actual production figures to the accounting month end of February 2001. The following table summarizes this spreadsheet and provides information on the available storage within the TCA for two distinct time periods. The first column represents the minimum storage available after winter use, prior to summer decanting of tailings solution (before thaw). The second column indicates the available storage after summer use and decant of tailings solution along with any accumulated runoff from spring melt and seasonal precipitation.

**TCA AVAILABLE STORAGE (m<sup>3</sup>)**

<b>YEAR</b>	<b>END OF MAY (Before water decant)</b>	<b>END OF AUGUST (After water decant)</b>
<b>2001</b>	1,701,102	2,077,867
<b>2002</b>	1,444,146	1,809,079
<b>2003</b>	1,175,358	1,539,994
<b>2004</b>	906,273	1,270,903
<b>2005</b>	637,182	1,001,811
<b>2006</b>	419,181	765,991
<b>2007</b>	331,453	615,208
<b>2008*</b>	333,142	333,142

\* Only a partial season due to cease of production at the end of April 2008. Water has not been decanted from cells, indicating the same storage at September 2008.

## FUTURE MODIFICATION PLANS

The previous summary table included the capacity of all available cells, excluding that of Cell No.4 which is used mainly as a holding cell (natural degradation of cyanide and metals treatment) for water before transfer to Pond No.1. Prior to the temporary shut down (September 1997) of the mining/milling operations at Lupin, engineering work had begun on evaluating options for additional storage within the current facility. These options include:

- i. the raising of perimeter dams No.5, No.6 and internal Kdam (Cell No.3)
- ii. the raising of internal divider dyke Mdam (Cell No.5)
- iii. the use of Cell No.4 for solids containment and construction of the internal "divider" dyke between this cell and Pond No.1; and
- iv. the construction of the End Lake perimeter dam (previous design work completed by Golder Associates prior to construction of dams 4, 5 and 6 in 1992).

Option (ii) has been incorporated into the Management Plan in that construction in 2000 raised the height of the internal dyke to a minimum of 488.5m. A further increase in capacity can be obtained by raising the dyke to be consistent with the other dykes at the 490m elevation. Either one or more of the above options can be utilized during the mine life at Lupin if additional storage is required for future tailings deposition. The critical period for maximum storage volume requirement is prior to the winter when both the solids and liquid components of the tailings require containment for approximately nine months due to freezing.

The use of Cell No.4 by the construction of the internal divider dyke would add approximately 2.0 million m<sup>3</sup> of storage. The option to expand Cell No.3 by increasing the perimeter dam and Kdam heights would provide an additional 525,000 m<sup>3</sup> of storage for each one metre raise in height. The End Lake option has the potential to provide an additional 1.5 million m<sup>3</sup> of storage volume and although is within the TCA, it has not been previously used for tailings solids and solution deposition and provides less average storage per square metre surface area than other options. It may be possible to utilize this area as a solution storage area if Cell No.4 were to be used for tailings solids, however this would have to be looked at in more detail if the option were to need further justification.

Currently there are no definite plans for bringing additional ore(s) in to Lupin from other sites, including the Ulu Project which has been on hold since 1998. The only other ore (sample materials) that has been processed at the Lupin Mine is the kimberlite bulk samples of both the

Tahera Jericho project and the Winspear Snap Lake project. The tailings and coarse waste from both these projects have been disposed of at the TCA within the current cells (Cell No.2). This material is not to be used as a "final cover" but has been placed (graded) within the cell and will be covered with esker as will the remainder of Cell No.2. Fine tailings material from the bulk sample projects was deposited within the tailings pond cells (Cell No.5) and since covered with fresh tailings material from the Lupin mill. There are no current plans (for processing other ores) or to utilize any of the previous kimberlite materials as a cover.

## **FUTURE TAILINGS MANAGEMENT STUDIES**

In November 2000, BGC Engineering Inc. proceeded with a program for the installation of replacement thermistors within the TCA perimeter dams, covered tailings and the Fingers Lake esker. Due to the unfrozen nature of some of the locations (frost had not yet penetrated to full depth below the surface), just over half of the planned thermistor string installations were completed. Difficulty was encountered in keeping the drill holes open in order to install the PVC casing in which the thermistor string would be installed. Water and soft ground were the major contributors to the problem. Thermistors were installed at the crest locations of Dam 1a and Dam 2, as well as at one location in the Fingers Lake Esker. These strings are functioning well and will hopefully provide the necessary data for closure modeling studies to be carried out in the near future. Completion of the thermistor installations is planned for early spring 2001, once freezing conditions are prevalent at the toes of the dams and at the Cell No.1 location where an addition 0.75-1.0 metre lift of esker material was placed.

In January 2001, Echo Bay Mines Ltd. submitted to consultant(s) a request for proposal for further studies with regard to the TCA. This work was to look at a number of concerns raised during the licencing process regarding the interaction of flooded areas of the TCA with covered cells, thermal effects upon the frozen tailings and, effects upon the frozen-core perimeter dykes. The proposals have been received and are to be considered for the 2002 Lupin Operations Budget. Much of the thermal study portion of this work can only be completed once data collection from the newly installed thermistors has provided a suitable benchmark with which to work from. Data collection at all locations is expected once the final thermistor installations are complete.





② This is the only area that could be covered this year 1998

NOTE:  
ORIGINAL SCALE - 1:5000 - PLOTTING RATIO OF 1/5 (METRIC)  
REDUCED SCALE OF 1:5000 - PLOTTING RATIO OF 1/5 (METRIC)  
SHEET NUMBERS REFER TO 1:5000 STEVART VECR LAND DATA MAPS

PLANNING BASED ON PHOTOGRAPHY BY STEVART VECR, AUG 1987

0 30 150 300 METERS

ECHO BAY MINES LTD.

LUPIN MINE  
TAILINGS AREA

DATE	BY	REVISION
1998	JAN	1
1998	FEB	2
1998	MAR	3
1998	APR	4
1998	MAY	5
1998	JUN	6
1998	JUL	7
1998	AUG	8
1998	SEP	9
1998	OCT	10
1998	NOV	11
1998	DEC	12

LUPIN DEVELOPMENT

10,000

DATSWIFT



# LUPIN TAILS CONTAINMENT AREA CAPACITY CALCULATIONS

TCA update 28Feb01.xls  
cmt

25%  
97.5% 1996 and 1997 averaged 34.8 % of solids to paste  
65% cu m water to 1 cu m solids  
4.25 Tonnes/cu m @ 25% moisture content  
3.01 Tonnes/cu m @ 0% moisture content  
1.956 500 cu m to 488.5 elev (as of Sep 2000)  
525,000 cu m to 488.5 elev (as of Jun 2000)  
39,375 cu m to 488.5 elev (as of Jun 2000)

% water permanently retained in tails =  
% remaining water decanted over summer =  
% mill throughput to tails =  
Average ratio Water/solids in 2000 =  
Specific gravity of solids =  
Specific gravity of solids =  
Cell 5 Capacity  
Cell 3 Capacity  
Cell 2 Capacity

	Monthly Tons Milled	Monthly Pulse U/G	Monthly Solids (dwt)	Monthly Solids To Tails	Monthly Solids (tonnes)	Monthly Solids To Tails	Monthly Water To Tails	Monthly Slurry Volume to Cell 5	Cell 5 Spring Runoff Volume	Monthly Water to Decant	Cell 5 Summer Decant Volume	Cell 5 Cumul Water to Decant	Cell 5 Cumul Slurry in cell	Cell 5 Storage Capacity Volume	Cell 3 Monthly Slurry Volume to Cell 3	Cell 3 Cumul Slurry Volume retained	Cell 3 Storage Capacity Volume	Cell 2 Monthly Slurry Volume to Cell 2	Cell 2 Cumul Slurry Volume retained	Cell 2 Storage Capacity Volume
Jun	64 050	22 418	41 633	37 761	12 545	53 317	0	0	0	172 761	270 216	1 134 571	821 929	66 862	322 818	202 182				
Jul	51 240	17 934	33 306	30 209	10 036	42 653	0	0	0	129 571	140 545	1 005 000	951 500	52 689	343 517	181 483				
Aug	51 240	17 934	33 306	30 209	10 036	42 653	0	0	0	129 571	11 074	875 428	1 081 071	52 689	354 216	160 784				
Sep	64 050	22 418	41 633	37 761	12 545	53 317	65 862	39 987	39 987	0	129 571	51 062	941 291	1 015 209						
Oct	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	83 052	993 980	962 520						
Nov	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	115 042	1 046 670	908 830						
Dec	64 050	22 418	41 633	37 761	12 545	53 317	65 862	39 987	39 987	0	129 571	155 029	1 112 531	843 969						
Jan 2005	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	187 019	1 165 221	791 279						
Feb	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	219 009	1 217 910	738 590						
Mar	64 050	22 418	41 633	37 761	12 545	53 317	65 862	39 987	39 987	0	129 571	258 996	1 283 772	672 728						
Apr	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	290 986	1 336 461	620 039						
May	51 240	17 934	33 306	30 209	10 036	42 653	52 689	120 000	151 990	0	129 571	442 976	1 509 150	447 350						
Jun	64 050	22 418	41 633	37 761	12 545	53 317	0	0	0	172 761	270 216	1 336 389	620 111	65 862	300 091	134 909				
Jul	51 240	17 934	33 306	30 209	10 036	42 653	0	0	0	129 571	140 545	1 005 000	749 681	52 689	410 790	114 210				
Aug	51 240	17 934	33 306	30 209	10 036	42 653	0	0	0	129 571	11 074	1 077 248	879 252	52 689	431 489	93 511				
Sep	64 050	22 418	41 633	37 761	12 545	53 317	65 862	39 987	39 987	0	129 571	51 062	1 143 110	813 390						
Oct	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	83 052	1 195 799	760 701						
Nov	51 240	17 934	33 306	30 209	10 036	42 653	52 689	31 990	31 990	0	129 571	115 042	1 248 489	708 011						
Dec	64 050	22 418	41 633	37 761	12 545	53 317	65 862	39 987	39 987	0	129 571	155 029	1 314 350	642 150						
Jan 2006	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	181 111	1 357 308	596 192						
Feb	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	207 192	1 400 265	556 235						
Mar	52 220	18 277	33 943	30 786	10 228	43 469	53 697	32 602	32 602	0	129 571	239 794	1 453 963	502 537						
Apr	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	265 875	1 496 920	459 580						
May	41 776	14 622	27 154	24 629	8 182	34 775	42 958	120 000	146 081	0	129 571	411 957	1 659 878	266 622						
Jun	52 220	18 277	33 943	30 786	10 228	43 469	0	0	0	160 963	251 294	1 499 215	457 285	53 697	452 585	72 415				
Jul	41 776	14 622	27 154	24 629	8 182	34 775	0	0	0	120 497	130 796	1 378 717	577 783	42 958	469 461	55 539				
Aug	41 776	14 622	27 154	24 629	8 182	34 775	0	0	0	120 497	10 299	1 259 220	698 280	42 958	486 337	38 063				
Sep	52 220	18 277	33 943	30 786	10 228	43 469	53 697	32 602	32 602	0	129 571	42 901	1 311 917	644 583						
Oct	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	68 962	1 354 875	601 625						
Nov	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	95 064	1 397 832	558 668						
Dec	52 220	18 277	33 943	30 786	10 228	43 469	53 697	32 602	32 602	0	129 571	127 665	1 451 529	504 971						
Jan 2007	22 456	7 860	14 596	13 239	4 398	18 693	23 091	14 020	14 020	0	129 571	141 685	1 474 621	481 879						
Feb	22 456	7 860	14 596	13 239	4 398	18 693	23 091	14 020	14 020	0	129 571	155 705	1 497 712	458 788						
Mar	28 070	9 825	18 246	16 549	5 498	23 366	28 864	17 525	17 525	0	129 571	173 229	1 526 576	429 924						
Apr	22 456	7 860	14 596	13 239	4 398	18 693	23 091	14 020	14 020	0	129 571	187 249	1 549 667	406 833						
May	22 456	7 860	14 596	13 239	4 398	18 693	23 091	120 000	134 020	0	129 571	321 268	1 692 758	263 742						
Jun	28 070	9 825	18 246	16 549	5 498	23 366	0	0	0	125 295	195 974	1 567 463	389 037	28 864	497 676	27 324				
Jul	22 456	7 860	14 596	13 239	4 398	18 693	0	0	0	93 971	102 003	1 473 492	483 008	23 091	506 748	18 252				
Aug	22 456	7 860	14 596	13 239	4 398	18 693	0	0	0	93 971	8 032	1 379 521	576 979	23 091	515 819	9 181				
Sep	52 220	18 277	33 943	30 786	10 228	43 469	53 697	32 602	32 602	0	129 571	40 633	1 433 218	523 282						
Oct	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	66 715	1 476 176	480 324						
Nov	41 776	14 622	27 154	24 629	8 182	34 775	42 958	26 081	26 081	0	129 571	92 796	1 516 134	437 366						
Dec	52 220	18 277	33 943	30 786	10 228	43 469	53 697	32 602	32 602	0	129 571	125 398	1 572 831	383 669						
Jan 2008	20 310	7 109	13 202	11 974	3 978	16 906	20 884	12 680	12 680	0	129 571	138 078	1 593 715	362 765						
Feb	20 310	7 109	13 202	11 974	3 978	16 906	20 884	12 680	12 680	0	129 571	150 758	1 614 600	341 900						
Mar	25 375	8 881	16 494	14 960	4 970	21 123	26 093	15 842	15 842	0	129 571	166 600	1 640 692	315 808						
Apr	20 320	7 112	13 208	11 980	3 980	16 915	20 895	12 686	12 686	0	129 571	179 286	1 661 587	294 913						

4 340 222 Total dry short tons planned milling January 2001 through to April 2008  
2 121 805 Total cubic metres of storage available as of January 2001 (Cell No 2 3 and 5)