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MTO Granular Aggregates Summary 2009

MERO-039

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Abstract

This report provides a summary of the quantities placed and the compliance of granular aggregates tested with MTO material specifications for the 2009 construction year. Each of the following granular aggregate types are summarized in this report: Granular A, Granular B Type I, Granular B Type II, Granular B Type III, Granular M, Granular O, and SSM.

The five Regional Quality Assurance Sections submitted data from contracts that were active during the 2009 construction season, and that data was summarized in a series of tables and graphs. Provincial and regional summaries are included for the quantities placed, the number of lots and quantities that were tested, as well as the number of lots and the quantities of material that were accepted at full price, accepted at a reduced price, and rejected.

During 2009, approximately 8.84 million-tonnes of granular materials were used in MTO's road construction contracts, of which a significant proportion, i.e. 17.3%, was produced from material excavated from within the right-of-way and 8.2% from reclaimed materials. Granular A represented 48% of the total granular materials placed by MTO.

About 3.47 million-tonnes, or 39.0% of the total granular aggregates that were placed, were tested to determine payment adjustments for quality assurance purposes during the 2009 construction season. Based on the total granular aggregates placed, the vast majority of that tonnage, i.e. 94.3%, was accepted at full price.

Key Words	Aggregates, acceptance, granular base, granular subbase, Ontario, price adjustments, provincial summary, quality assurance.
Distribution	Limited distribution to technical audience

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1.0 - Executive Summary

Each year, the Ministry of Transportation of Ontario (MTO) uses large quantities of granular aggregates for road construction purposes. This report is intended to capture the available information on the quantities and quality of granular materials supplied for road base and subbase, backfill, and other purposes.

Data sheets summarizing the quantity and quality of granular aggregates used in 107 contracts for road construction during the 2009 construction season were received by the Soils and Aggregates Section at MTO. Based on this, approximately 8.835 million tonnes of granular aggregates were placed, of which 65.2% came from commercial sources, 9.3% came from non-commercial sources, 17.3% were produced from rock that was obtained within the ROW, and 8.2% came from reclaimed materials (i.e. RAP and RCM).

At MTO, granular materials are specified according to standard special provision (i.e. SSP) 110S13.

Granular A represented 47.9% of the total granular aggregates placed and Granular B (i.e. types I, II and III) represented 46.7%. Granular O, Granular M, and SSM made up the remaining 5.4% of the total used.

Based on the QA acceptance system that was in place during 2009, approximately 3.47 million tonnes, or 39% of the total granular aggregates that were placed, were tested for quality assurance purposes. Most of the tonnage, i.e. 85.5%, was accepted at full price, 14.4% was accepted with an adjusted price and the remaining 0.1% was rejected. However, since 39% of the materials placed were actually tested, 94.3% of the granular aggregates that were placed were accepted at full price, 5.6% accepted with an adjusted price and 0.06% rejected.

2.0 - Introduction

Each year, MTO uses large quantities of aggregates for the construction, rehabilitation, and maintenance of provincial highways. These aggregates are continuously sampled and tested to provide evidence that they meet the physical quality and gradation requirements that are identified by the specifications contained within the contract documents of each project. Specifications have been developed to ensure that the aggregates meet the engineering needs for the intended application and to establish administrative procedures for acceptance and payment to the contractor.

For MTO's purposes, granular aggregates may be defined as unbound aggregates which are used for a variety of road construction purposes. Within the Highway Standards Branch of MTO, the Soils and Aggregates Section is responsible for material and construction specifications for Granular A (used for base, gravel sheeting, shoulder and bedding and backfill to sewers, culverts, and other structures), Granular O (used as a permeable granular base), Granular B, Types I, II, and III (used for subbase and backfill), Granular M (used for shoulder maintenance), and SSM (for subgrade material).

This report summarizes the quantities involved and the quality assurance acceptance of the granular aggregates that were used in MTO contracts for road construction purposes during the 2009 construction season. The summaries are presented as a series of tables and graphs showing the tonnages placed and the proportions of those materials that were accepted at full price, accepted with an adjusted price, or were found to be rejectable. Although several tests are used for quality assurance purposes, only the results for gradation and percent crushed (i.e. for Granular A only) are presented here. The results of these tests have been found to vary the most and, as such, have generally been used as the basis for acceptance (and payment adjustments) of granular aggregate materials.

The main body of this report generally summarizes the data on a provincial basis with more detailed regional summaries presented in the Appendices.

3.0 - Background

MTO's acceptance of granular aggregates is based on test results performed on samples taken from individual lots of material. The gradation and other quality-related aspects of these materials, and the protocol for establishing the size of each of the lots and how they are accepted, is based on MTO's Standard Special Provision (i.e. SSP) 110S13 (MTO, 1997). This SSP replaces the current version of the Ontario Provincial Standard Specification (OPSS) 1010 to meet MTO's specific requirements for Quality Assurance.

Prior to 2009, the quantities of granular aggregates placed, and the number of lots tested and accepted, were recorded in PDF format on ®Word-based Granular Summary Sheets. However, for each granular material, a separate form had to be filled out and then the data manually transferred into an ®Excel-based file in order to summarize it.

To avoid the tedious transfer of data, an ®Excel-based data-gathering template, entitled a "QA Granular Summary Sheet" was developed to replace the original ®Word-based form. These new Granular Summary Sheets capture quantity summaries, details of the lots tested, and the disposition of those lots (i.e. such as whether they were accepted at full price, reduced price, or rejected) for all granular materials used on the contract.

The new QA Granular Summary Sheets were given to the Contract Administrators at the beginning of each contract. At the end of the 2009 construction year, the completed templates were then submitted back to the Soils and Aggregates Section, through the appropriate Regional Quality Assurance Office. The Soils and Aggregates Section then used a new data collection and calculation system (i.e. global file) which was also developed to automatically analyze, summarize, and present the data.

This report summarizes the quantity and quality of the granular aggregates that were used by MTO in road construction contracts during the 2009 construction season based on templates that were completed and received by the Soils and Aggregates Section before March 2010. The summaries are presented as a series of tables and graphs showing the tonnages of the aggregates that were obtained from conventional sources (i.e. pits and quarries), aggregates processed from material obtained from within the Right-Of-Way (ROW), reclaimed materials that were used, as well as how each of the individual granular types met the acceptance criteria. For the most part, the main body of this report summarizes the data on a provincial basis, with more detailed regional summaries presented in Appendices.

4.0 - Quantity Summaries

During 2009, the Soils and Aggregates Section received completed QA Granular Summary Sheets from a total of 107 contracts. It should be noted that, based on information obtained elsewhere, this is likely to represent about two-thirds of the actual quantities used by MTO.

Each Granular Summary Sheet included the quantities of each different granular aggregate that were used on each contract on the basis of the production obtained from commercial sources, non-commercial sources, or aggregates produced from rock materials obtained from within the ROW.

For Granular A, BI, BIII, and M, the summaries also included the quantities of Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Concrete Material (RCM) that were used. Although MTO also allows other waste products such as blast furnace slag, nickel slag, glass, and ceramics to be used in these granular aggregates, there was no reported use of any of these materials during the 2009 construction season.

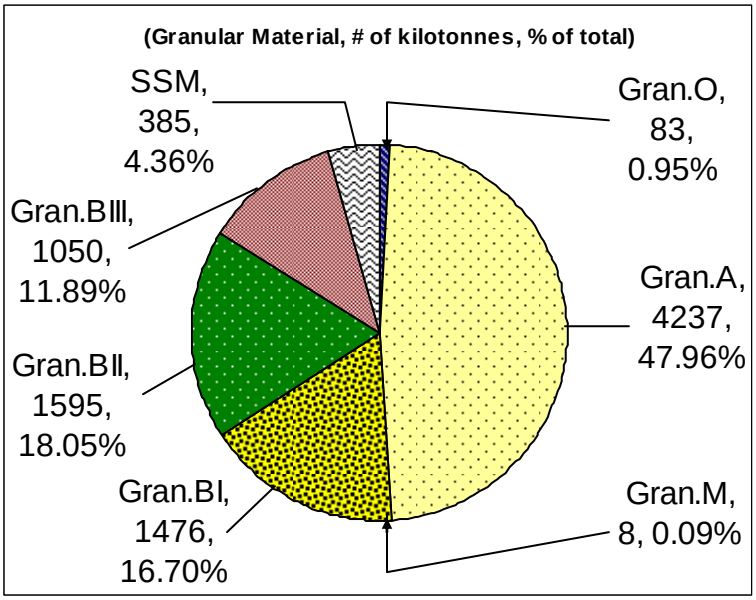
4.1 - Quantities of Granular Materials by Type in 2009

Table 1 and Figure 1 summarize the total quantities of granular aggregates by type that were placed in each MTO region across the province during the 2009 construction season.

Table 1: Quantity Summary of Granular Aggregates Used by Each MTO Region in 2009

Granular Material	Kilotonnes					
	Regions					Provincial MTO Totals
	Central	Eastern	Northeastern	Northwestern	West	
Gran. A	845	314	1581	276	1221	**4237**
Gran. BI	1001	0	475	0	0	**1476**
Gran. BII	61	362	1119	25	27	**1595**
Gran. BIII	20	310	39	69	613	**1050**
Gran. O	0	83	0	0	0	**83**
Gran. M	0	0	8	0	0	**8**
SSM	103	0	281	0	0	**385**
Totals (# of Contracts)	**2031 (20)**	**1069 (11)**	**3504 (50)**	**370 (8)**	**1861 (18)**	**8835 (107)**

Figure 1: Total Quantities of Each Granular Aggregate Used by MTO in 2009



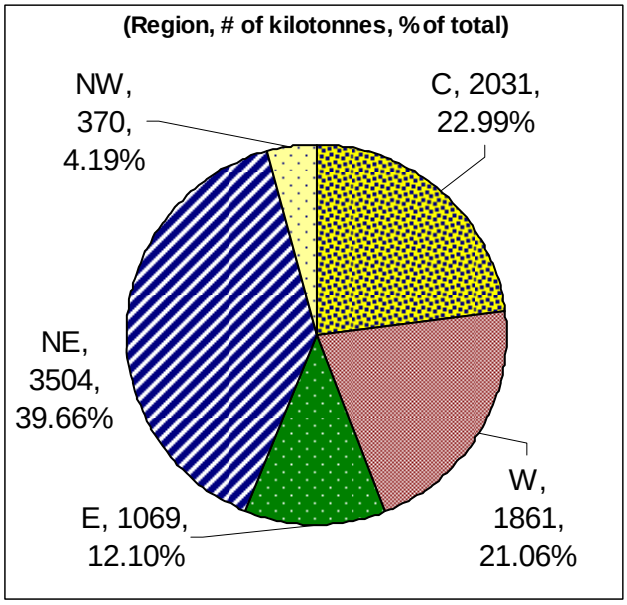
A total of 8.84 million tonnes of granular aggregates were placed by MTO in 2009.

Granular A was included in all but two of the contracts that were reported and provided the largest quantity, i.e. 4.24 million tonnes, or 48.0% of the total quantity of granular aggregates placed. This quantity includes materials coming from all possible sources, including commercial sources, non-commercial sources, aggregates produced from materials that were excavated from within the ROW, and reclaimed materials.

Granular B (Types I, II, and III) represented 4.11 million tonnes or 46.6% of the granular materials placed by MTO during 2009. SSM only represented approximately 4.4% of the total granular aggregates placed (and only from Central and Northeastern Regions), and Granular O represented 1.0% of the total (from two contracts in Eastern Region). Granular M was used on only one contract in Northeastern Region in 2009.

Figure 2 shows the total quantities of all granular aggregates placed and the proportions used by each MTO region in 2009.

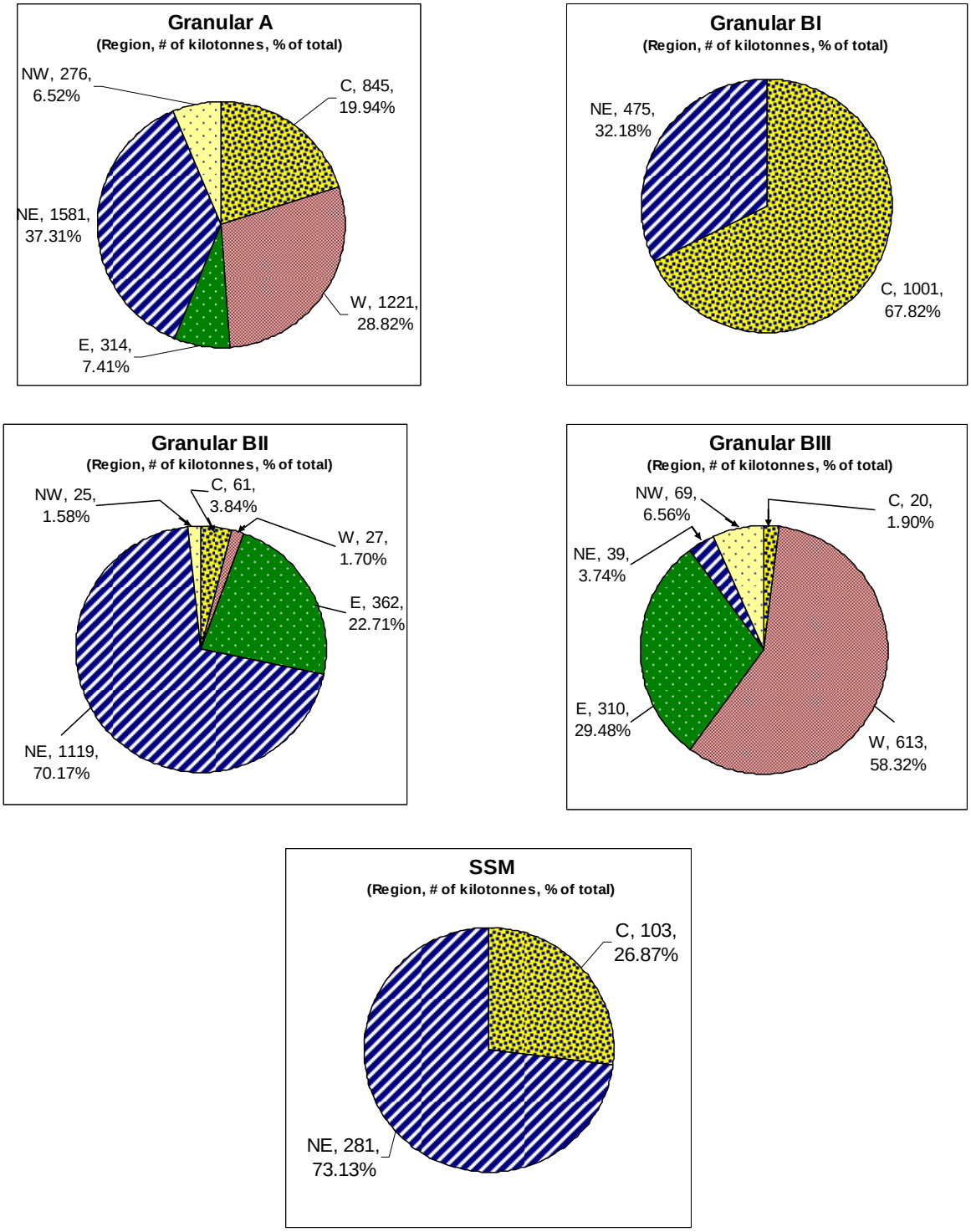
Figure 2: Total Quantities of Granular Aggregates Used by Each MTO Region in 2009



Northeastern Region used the largest quantity of granular aggregates (i.e. 3.50 million tonnes or 39.7%), followed by Central (23.0%), West (21.1%), Eastern (12.1%), and Northwestern Region 4.2%).

Figure 3 shows the quantities and the percentages of each different granular aggregate (excluding Granular M and O) that were used broken down on a regional basis. Granular A was used in all five MTO regions with Northeastern and West Regions placing 66.1% of the total. Granular BI was only used in Central and Northeastern Regions, with Central Region placing 67.8% of the total or 1.00 million tonnes. Northeastern Region placed 70.2% or 1.12 million tonnes of Granular BII, with Eastern Region placing approximately 22.7% or 0.36 million tonnes. The remainder was placed by the other three regions. Granular BIII was also used in all five regions with the largest quantities by far being placed in West Region (58.3%) and Eastern Region (29.5%). SSM was only placed in Northeastern Region (73.1% or 0.28 million tonnes) and Central Region (26.9% or 0.10 million tonnes).

Figure 3: Quantities of Granular Aggregates Used by Each MTO Region in 2009



4.2 - Quantities By Material Source

Table 2 summarizes the total quantities of granular aggregates that were used in 2009 by each MTO region on the basis of source. These include commercial sources (i.e. licensed pits and quarries), non-commercial sources, aggregates produced from rock materials excavated from within the ROW, and reclaimed/recycled materials. Note that, in Ontario, non-commercial sources collectively refer to wayside sources, Crown sources, Letter of Approval sources, and Indian Land sources, as defined under the Aggregate Resources Act.

The detailed breakdown of these quantities by region and granular aggregate type are summarized in Appendix A. For the purposes of this report, natural aggregates include aggregates excavated from pits or produced from blasted rock in quarries or produced from within the right-of-way.

Table 2: Quantities of Natural Aggregates and Recycled Materials Used in Granular Aggregates by Each MTO Region in 2009 by Source

Source	Kilotonnes						%	
	Region					Province	Natural Aggregates or Recycled Materials	Total Granular Aggregates
	C	W	E	NE	NW	Total		
Commercial Source	1596	1359	1035	1478	292	5760	71.0	65.2
Non-commercial Source	124	0	31	635	36	826	10.2	9.4
Material from Right-of Way	0	130	0	1369	31	1530	18.8	17.3
Total Natural Aggregate	1720	1488	1066	3482	359	8116	100.0	91.9
RAP	298	104	3	10	11	426	59.2	4.8
RCM	14	268	0	11	0	293	40.8	3.3
Glass/Ceramics	0	0	0	0	0	0	0	0
Other Recycled/Reclaimed Materials	0	0	0	0	0	0	0	0
Total Recycled/Reclaimed Materials	312	372	3	21	11	719	100.0	8.1
TOTALS	**2032**	**1861**	**1069**	**3503**	**370**	**8835**		**100.0**

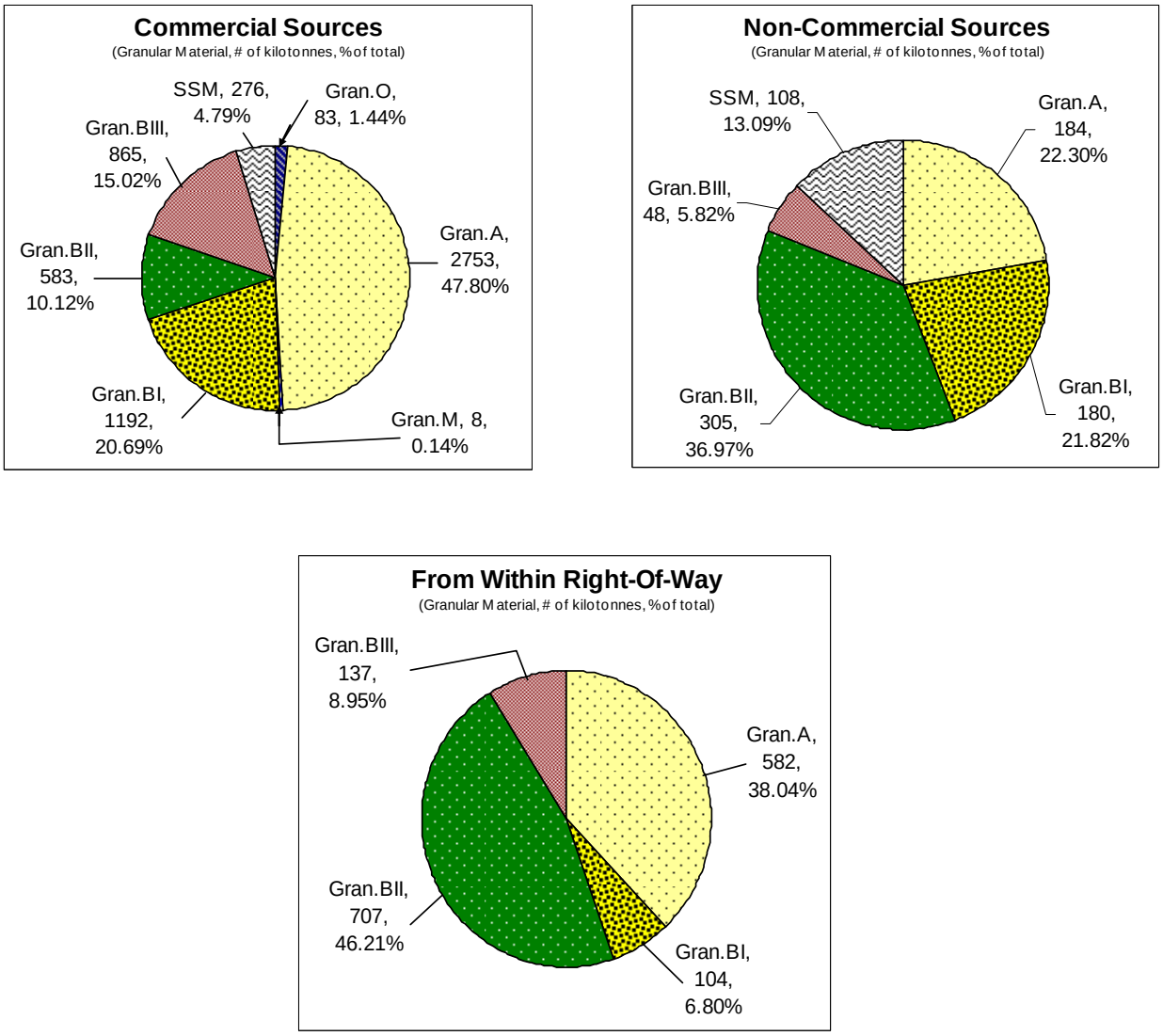
The majority of the granular aggregates used by MTO or 65.2% came from commercial sources. However a very significant proportion of the granular aggregates used (i.e. 17.3%) were produced from rock excavated within the right-of-way. Granular aggregates produced from non-commercial sources represented 9.4% and RAP and RCM made up the remaining 8.1% of the granular aggregates used.

Figure 4 shows the tonnages and the proportions of each granular aggregate type that were obtained from commercial sources, non-commercial sources and from rock materials excavated within the ROW.

The aggregates used as Granular A, BI, BII, or BIII came from all three of these sources, but Granular

O and M was only produced from commercial sources. Bar charts showing the quantities of each granular aggregate type that were produced from each different source on a regional basis are also presented in Appendix B.

Figure 4: Total Quantities of Granular Aggregates Used by MTO in 2009 By Source



4.3 - Recycled/Reclaimed Materials

Although MTO's specifications allow blast furnace slag, nickel slag and glass and/or ceramics to be used in Granular A, BI, BII, and M, only Reclaimed Asphalt Pavement (RAP) and Recycled Concrete Material (RCM) were reported to be actually used in 2009.

Figure 5 shows that a total of 718 kilotonnes of reclaimed materials were used in granular aggregates in 2009, with RAP representing 59.2% of it and RCM 40.8%.

The total quantities and the proportion used by each MTO region are presented in Figure 6. West and Central Regions used 95.1% or 683 kilotonnes of the total recycled/reclaimed materials in granular aggregates. This can be attributed to the relatively large number of sources of such materials available to road construction projects within these regions. In comparison, the remaining three regions only used 35 kilotonnes of recycled/reclaimed construction materials, due to the lack of available sources of large quantities of these materials and the generally high transportation costs involved when they are used in those regions.

It is recognized that full-depth reclamation (FDR) is a process that is used by MTO, which significantly reduces the need for granular aggregates. However, since FDR is done in-place, and the aggregates produced are not actually used in a particular granular aggregate type, it has not been dealt with in this report.

Figure 5:

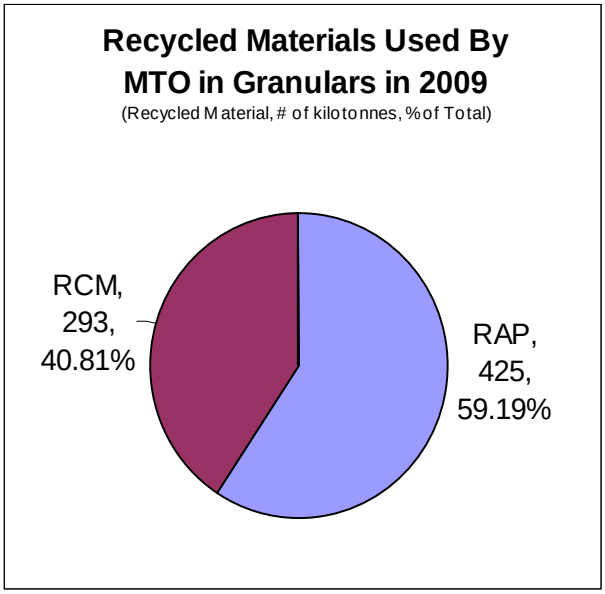
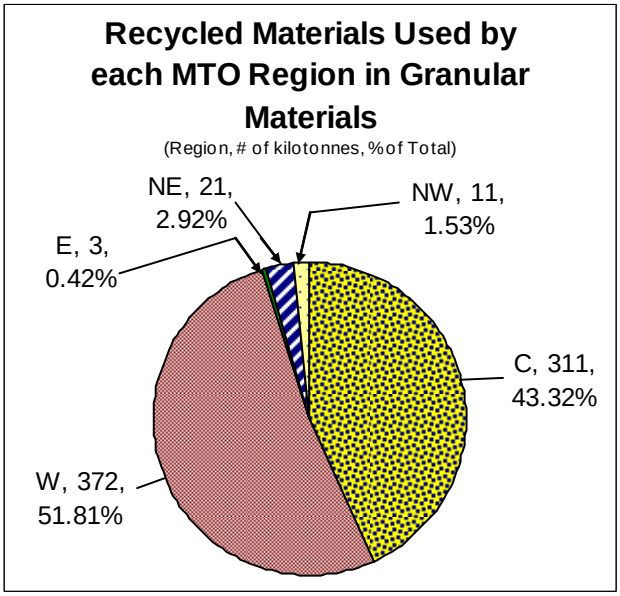


Figure 6:



4.4 - ACCEPTANCE OF GRANULAR AGGREGATES

Granular aggregates used for road base and subbase materials that include SSP 110S13 are sampled after placement and prior to compaction. Such materials are tested and accepted on the basis of a lot/sublot system according to the following schedule:

i) One lot consisting of the first 5,000 tonnes delivered to the work;
ii) A 5,000 tonne lot selected from within the next 15,000 tonnes of delivered material;
iii) A 7,500 tonne lot selected from within the next 30,000 tonnes of delivered material; and.
iv) A 10,000 tonne lot selected from within each 50,000 tonnes of delivered material thereafter.

The lot schedule will continue as presented above as long as the lots being tested are found to be acceptable. However, if at some point during the contract, a lot is not accepted at full price, then the lot schedule reverts back to 5,000 tonne lots and the lot sizes only allowed to increase when two consecutive 5,000 tonne lots are accepted at full price. So the quantity of material within the lots being tested will almost always be less than the actual quantity being placed on a contract.

Each lot is divided into four equal sublots and a sample is randomly obtained from each sublot for testing. The mean and range of the percent passing for the four sublots on each sieve in a gradation test (and % crushed for Granular A only) form the main basis for acceptance of the lot.

Physical property testing (such as micro-Deval and freeze-thaw) is also done for acceptance. However, since the material for these tests is accepted on a pass/fail basis, these tests are not used for production testing and are not dealt with in this report.

If the mean and range for gradation (and for Granular A, % crushed) within a tested lot is found to be acceptable, then all of the material within that lot will be accepted and paid for at full price. However, if the granular aggregate does not meet these requirements, adjustment points are accrued and the lot that was tested will be paid for at an adjusted (i.e. reduced) price. Depending upon the particular granular material involved, when adjustment points reach a specific value, then the lot is rejectable.

Before the lot is given an adjusted price, the Contractor has the option of going to referee testing. The results of such testing are always binding on both parties. The results that the Soils and Aggregates Section have received include the results for any referee testing that may have been conducted.

Table 3 shows a summary of the total quantities of each different granular aggregate placed, the number of lots and the associated quantities that were tested in 2009, as well as the number of lots, the associated quantities, and the percentages of the totals that were accepted at full price, accepted with an adjusted price, or were rejected. The data is summarized on the basis of all of the QA Granular Summary Sheets that were received by the Soils and Aggregates Section. Detailed summaries for each of MTO's five regions are given in Appendices C and D.

Table 3: Lot Summary and Disposition of Each Lot of Granular Aggregate Tested by MTO in 2009 (Quantities in kilotonnes)

	Granular Aggregate Type							Provincial Totals
	O	**A**	**M**	**BI**	**BII**	**BIII**	**SSM**	
Total Qty. Placed	83	4237	8	1476	1595	1050	385	**8835**
# of Lots Tested	11	303	1	93	91	60	18	**577**
Total Qty. Tested (% placed)	53 (63.86)	1721 (40.62)	8 (100.00)	606 (41.06)	596 (37.37)	380 (36.19)	106 (27.53)	**3470** **(39.28)**
# of Lots Accepted at Full Price (% tested)	7 (13.21)	236 (77.89)	1 (100.00)	88 (94.62)	82 (90.11)	56 (93.33)	15 83.33)	**485** **(84.06)**
Qty. Within Tested Lots Accepted at Full Price (% tested)	33 (62.26)	1355 (78.73)	8 (100.00)	581 (95.87)	541 (90.77)	357 (93.95)	91 (85.85)	**2966** **(85.48)**
Qty. Actually Accepted at Full Price (% placed)	63 (75.90)	3871 (91.36)	8 (100.00)	1451 (98.31)	1540 (96.55)	1027 (97.81)	370 (96.10)	**8331** **(94.30)**
# of Lots Accepted at Adjusted Price (% tested)	4 (36.36)	67 (22.11)	0 (0.00)	4 (4.30)	9 (9.89)	4 (6.67)	3 (16.67)	**91** **(15.77)**
Qty. Within Tested Lots Accepted at an Adjusted Price (% tested/% placed)	20 (37.77/ 24.10)	367 (21.32/ 8.66)	0 (0.00/ 0.00)	20 (3.30/ 1.36)	55 (9.23/ 3.45)	23 (6.05/ 2.19)	15 (14.15/ 3.90)	**499** **(14.38/ 5.65)**
# of Lots Rejected (% tested)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.08)	0 (0.00)	0 (0.00)	0 (0.00)	**1** **(0.17)**
Qty. Rejected (% tested/ % placed)	0 (0.00/ 0.00)	0 (0.00/ 0.00)	0 (0.00/ 0.00)	5 (0.83/ 0.34)	0 (0.00/ 0.00)	0 (0.00/ 0.00)	0 (0.00/ 0.00)	**5** **(0.14/ 0.06)**

As Table 3 shows, a total of 577 lots representing approximately 3.470 million tonnes of granular aggregates were tested on MTO contracts. This represents 39.3% of the total quantity that was placed.

Overall, 84.1% of the lots that were tested were accepted at full price. However, since 60.7% of the material that was placed was not tested and untested material is accepted at full price, 94.3% of the granular material that was placed was accepted at full price. The results also indicate that, on average, 15.8% of the tested lots were accepted with an adjusted price (5.6% based on the total quantity placed) and only one lot of Granular BI was rejected.

All of the Granular M tested was accepted at full price. For the three types of Granular B, between 90.9% and 95.9% of the total quantity tested was accepted at full price (96.6 to 98.3% based on the

total quantity placed). However, only 78.7% of the Granular A tested (91.4% of the total quantity placed) was accepted at full price. This represents a fairly significant amount (i.e. 67 kilotonnes) of price-adjusted material. Although a much smaller percentage of Granular O (i.e. 62.3% of the material tested) was accepted at full price than Granular A, only 4 kilotonnes of that material was actually placed and, as such, represented only a small amount of price-adjusted material.

The details of each individual sieve where the adjustment points were accrued on a provincial basis are given in Tables 4 to 7 for all seven granular aggregate materials. All of these tables are based on weighted averages of the mean, range, and total payment adjustment factors.

For instance, in Table 4, the weighted averages for each sieve were determined by summing up the adjustment points accrued on that sieve multiplied by the tonnage tested for all contracts using the same granular material and then dividing that number by the total tonnage tested across the province. Table 5 presents similar data but it is weighted on the basis of the total tonnage placed. Figure 7 presents the data from these two tables in bar chart form and graphically shows the sieves where the payment adjustments were the most prevalent.

Tables 6, 7, and Appendix E are very similar to Tables 4, 5, and Figure 7, respectively, except that the weighted averages are based on the average payment adjustments in ¢/tonne. In this case, the weighted averages from Tables 4 and 5 are combined with the following prices for the various granular aggregate types:

Granular A, O, and M:	$14 per tonne;
Granular BII:	$12 per tonne;
Granular BI and BIII:	$10 per tonne; and
SSM:	$8 per tonne

It should be noted, however, that the prices given above have been taken from SSP 110S13 and may not necessarily reflect the actual prices paid for these aggregates for the granular materials used during the 2009 construction season.

Table 4: Weighted Average Payment Adjustment Factors of Granular Materials Based on Lot Quantities Tested in 2009

	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.00	0.00	0.00				0.05	0.00	0.05				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.00	0.00	0.00																		
26.5	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.15	0.15	0.14	0.00	0.14				0.00	0.00	0.00
19.0	0.00	0.08	0.08	0.01	0.04	0.05										0.00	0.00	0.00			
13.2	0.00	0.00	0.00	0.00	0.05	0.05										0.00	0.00	0.00			
9.5	0.40	0.00	0.40	0.05	0.15	0.20							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	0.00	0.00	0.00	0.52	0.24	0.76	0.00	0.00	0.00	0.02	0.23	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.09	0.00	0.09	0.10	0.02	0.13	0.00	0.00	0.00	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	0.57	0.00	0.57	0.22	0.01	0.23	0.69	0.03	0.73	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.76	0.76
Total	1.06	0.08	1.14	0.95	0.51	1.46	0.69	0.03	0.73	0.03	0.43	0.45	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.76	0.76

Table 5: Weighted Average Payment Adjustment Factors of Granular Materials Based on Quantities Placed in 2009

	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.00	0.00	0.00				0.02	0.00	0.02				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.00	0.00	0.00																		
26.5	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.06	0.06	0.05	0.00	0.05				0.00	0.00	0.00
19.0	0.00	0.05	0.05	0.00	0.02	0.02										0.00	0.00	0.00			
13.2	0.00	0.00	0.00	0.00	0.02	0.02										0.00	0.00	0.00			
9.5	0.25	0.00	0.25	0.02	0.06	0.08							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	0.00	0.00	0.00	0.21	0.10	0.31	0.00	0.00	0.00	0.01	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.06	0.00	0.06	0.04	0.01	0.05	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	0.36	0.00	0.36	0.09	0.00	0.09	0.29	0.01	0.30	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.21	0.21
Total	0.67	0.05	0.73	0.39	0.21	0.59	0.29	0.01	0.30	0.01	0.16	0.17	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.21	0.21

Table 6: Weighted Average Payment Reduction of Granular Materials Based on Lot Quantities Tested in 2009 (¢/tonne)

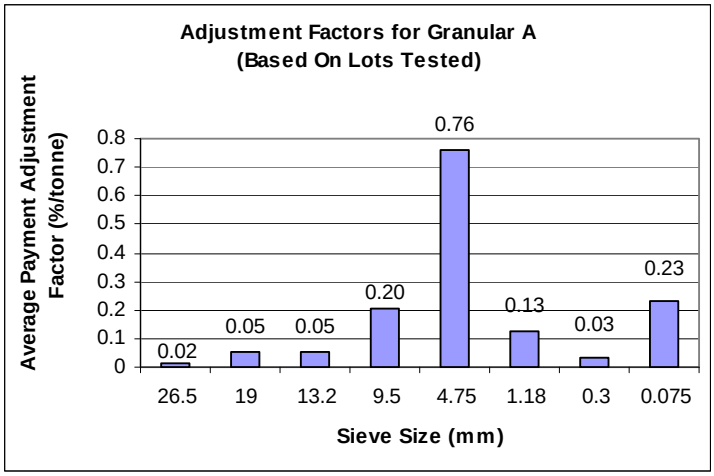
	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.00	0.00	0.00				0.51	0.00	0.51				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.00	0.00	0.00																		
26.5	0.00	0.00	0.00	0.18	0.05	0.23	0.00	0.00	0.00	0.00	1.81	1.81	1.45	0.00	1.45				0.00	0.00	0.00
19.0	0.00	1.19	1.19	0.12	0.59	0.71										0.00	0.00	0.00			
13.2	0.00	0.00	0.00	0.03	0.66	0.70										0.00	0.00	0.00			
9.5	5.55	0.00	5.55	0.73	2.10	2.83							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	0.00	0.00	0.00	7.34	3.30	10.64	0.00	0.00	0.00	0.24	2.77	3.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	1.32	0.00	1.32	1.45	0.31	1.76	0.00	0.00	0.00	0.02	0.41	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.42	0.00	0.42	0.00	0.00	0.00	0.05	0.06	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	7.93	0.00	7.93	3.03	0.17	3.19	6.95	0.35	7.29	0.00	0.05	0.05	0.51	0.00	0.51	0.00	0.00	0.00	0.00	6.10	6.10
Total	14.80	1.19	15.99	13.31	7.18	20.49	6.95	0.35	7.29	0.31	5.10	5.41	2.48	0.00	2.48	0.00	0.00	0.00	0.00	6.10	6.10

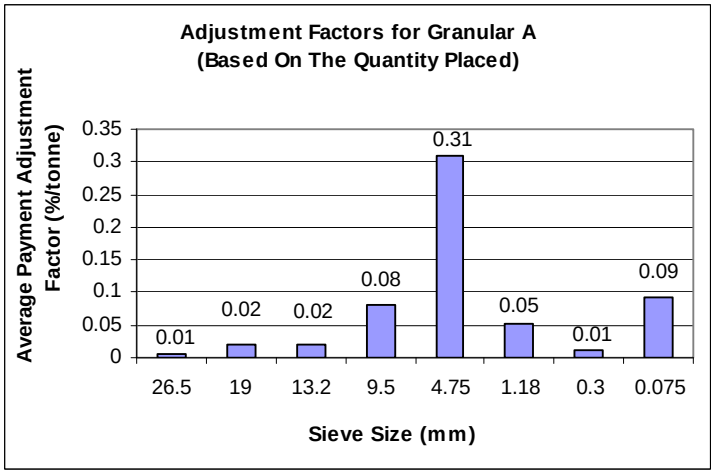
Table 7: Weighted Average Payment Reduction of Granular Materials Based on Total Quantities Placed in 2009 (¢/tonne)

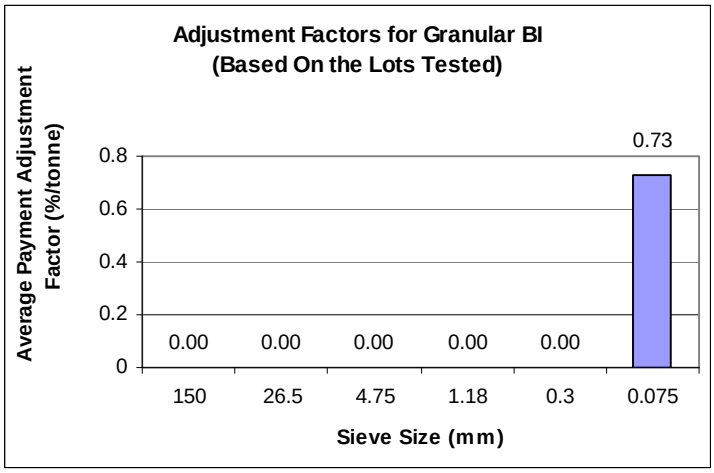
	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.00	0.00	0.00				0.19	0.00	0.19				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.00	0.00	0.00																		
26.5	0.00	0.00	0.00	0.07	0.02	0.09	0.00	0.00	0.00	0.00	0.68	0.68	0.52	0.00	0.52				0.00	0.00	0.00
19.0	0.00	0.76	0.76	0.05	0.24	0.29										0.00	0.00	0.00			
13.2	0.00	0.00	0.00	0.01	0.27	0.28										0.00	0.00	0.00			
9.5	3.53	0.00	3.53	0.30	0.85	1.15							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	0.00	0.00	0.00	2.98	1.34	4.32	0.00	0.00	0.00	0.09	1.03	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.84	0.00	0.84	0.59	0.13	0.71	0.00	0.00	0.00	0.01	0.15	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.17	0.00	0.17	0.00	0.00	0.00	0.02	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	5.04	0.00	5.04	1.23	0.07	1.30	2.85	0.14	2.99	0.00	0.02	0.02	0.19	0.00	0.19	0.00	0.00	0.00	0.00	1.69	1.69
Totals	9.41	0.76	10.17	5.41	2.92	8.32	2.85	0.14	2.99	0.12	1.91	2.02	0.89	0.00	0.89	0.00	0.00	0.00	0.00	1.69	1.69

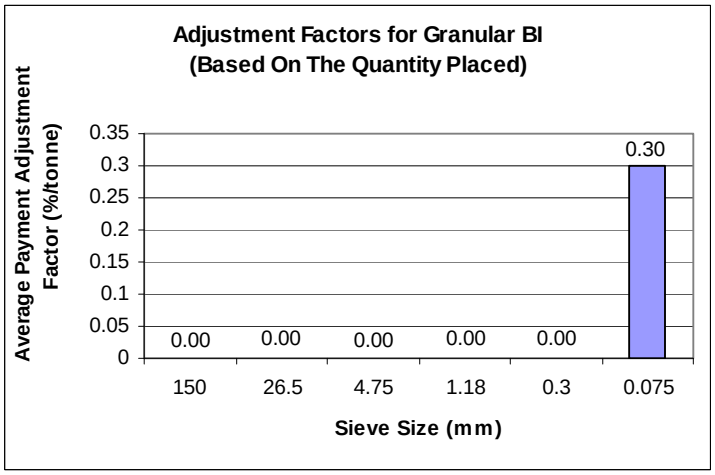
Based on the lots tested, the largest weighted average payment adjustment factor for both Granular A and Granular BII was accrued on the 4.75 mm sieve (i.e. 0.76 /tonne for Granular A and 0.25 /tonne for Granular BII). For Granular BI and SSM, adjustment factors were only accrued on the 0.075 mm sieve. For Granular O, there were adjustment points accrued on four sieve sizes, with the largest number of adjustment points being accrued on the 0.075 mm sieve. For Granular BIII, the largest payment adjustment factor of 0.14/tonne (again based on the lots tested) was accrued on the 26.5 mm sieve.

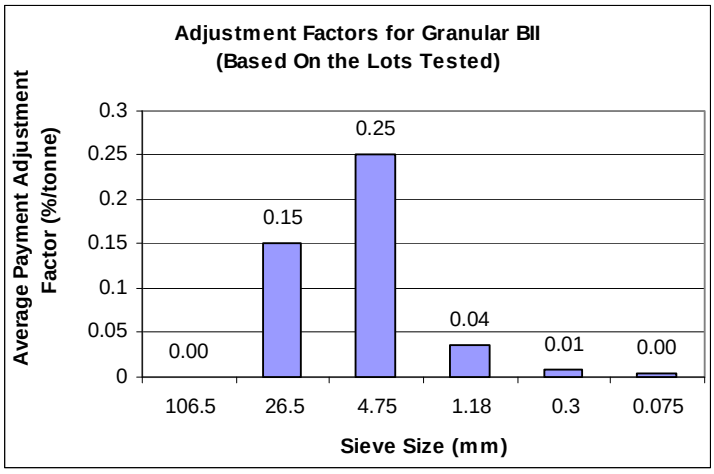
Figure 7: Weighted Average Payment Adjustment Factors for Granular Materials for all MTO Regions in 2009

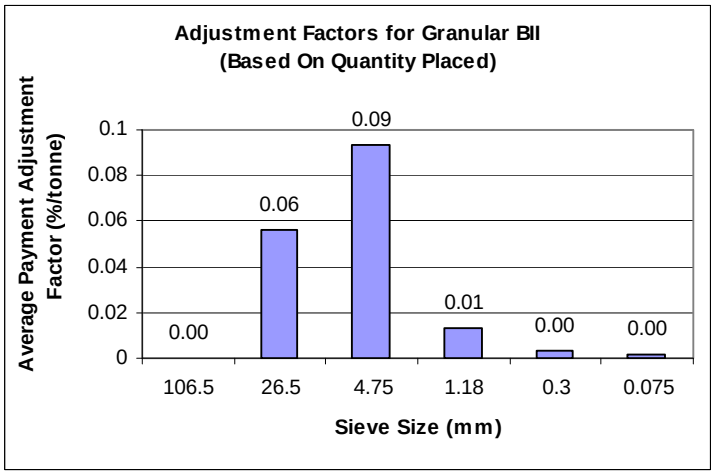


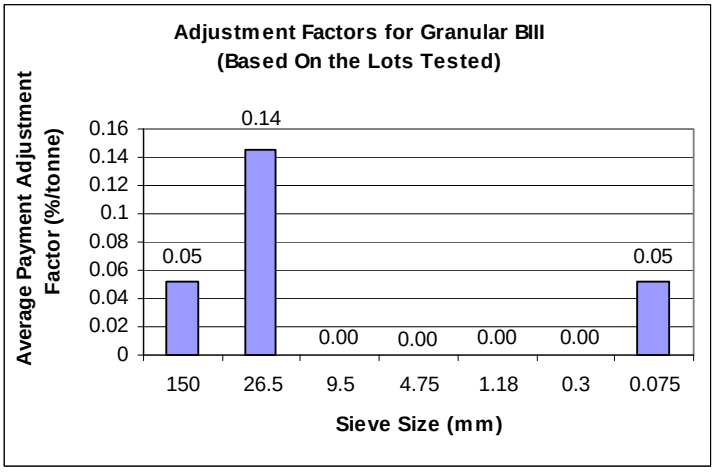


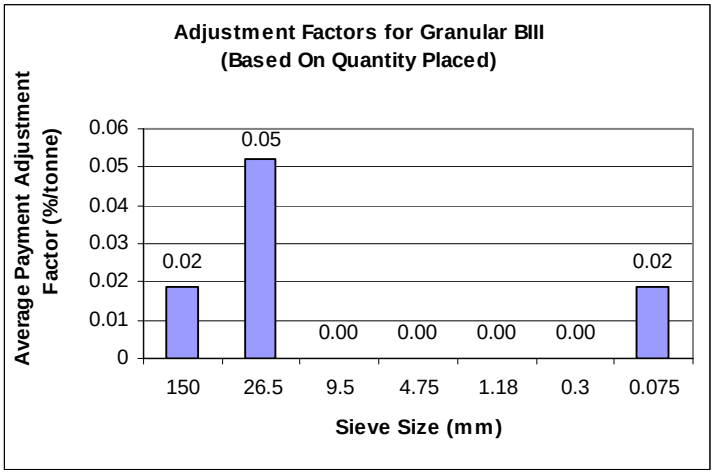


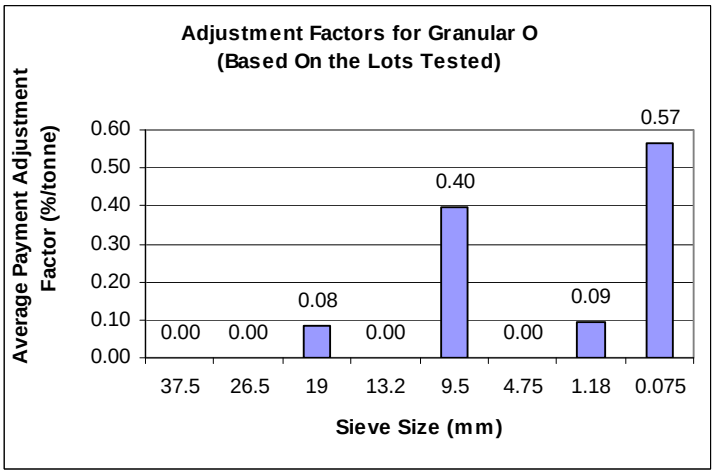


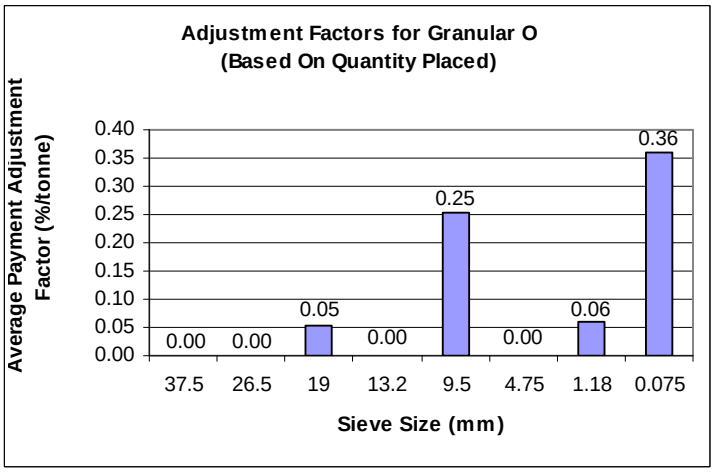

Adjustment Factors for Granular BII
(Based On the Lots Tested)
Average Payment Adjustment Factor (%/tonne)
0.3
0.25
0.2
0.15
0.1
0.05
0
0.00
0.15
0.25
0.04
0.01
0.00
106.5
26.5
4.75
1.18
0.3
0.075
Sieve Size (mm)

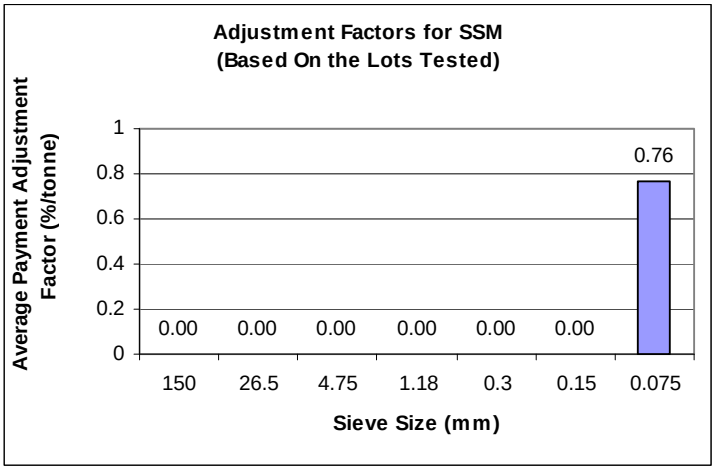

Adjustment Factors for Granular BII
(Based On Quantity Placed)
Average Payment Adjustment Factor (%/tonne)
0.1
0.08
0.06
0.04
0.02
0
0.00
0.06
0.09
0.01
0.00
0.00
106.5
26.5
4.75
1.18
0.3
0.075
Sieve Size (mm)

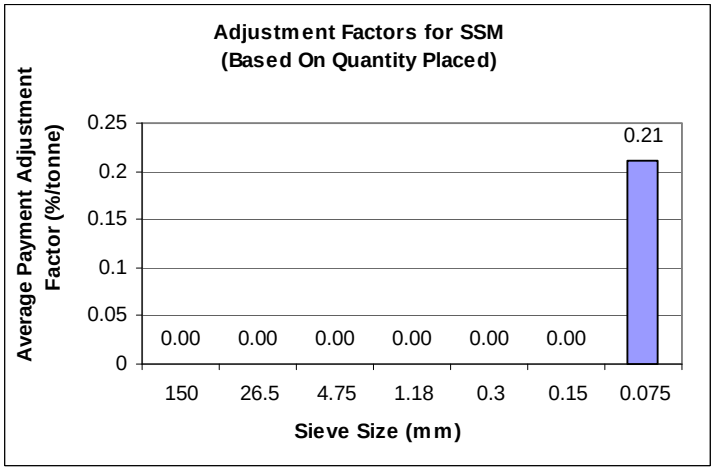

Adjustment Factors for Granular BIII
(Based On the Lots Tested)
Average Payment Adjustment Factor (%/tonne)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0.05
0.14
0.00
0.00
0.00
0.00
0.05
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Adjustment Factors for Granular BIII
(Based On Quantity Placed)
Average Payment Adjustment Factor (%/tonne)
0.06
0.05
0.04
0.03
0.02
0.01
0
0.02
0.05
0.00
0.00
0.00
0.00
0.02
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Adjustment Factors for Granular O
(Based On the Lots Tested)
Average Payment Adjustment Factor (%/tonne)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.00
0.08
0.00
0.40
0.00
0.09
0.57
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)


Adjustment Factors for Granular O
(Based On Quantity Placed)
Average Payment Adjustment Factor (%/tonne)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.00
0.05
0.00
0.25
0.00
0.06
0.36
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)





The overall average number of adjustment points being accrued on granular aggregates that were tested by MTO represents a total savings to the ministry of approximately $450,000 in 2009 based on the aggregate prices that were assumed in these analyses.

It should be noted that, since only 39.3% of the material placed was actually tested, the savings to MTO would likely have been significantly higher, assuming that the untested material is of similar quality to the tested material and that the relative cost to do the additional testing is also similar.

5.0 - Summary

Based on the 107 contract QA Granular Summary Sheets received by the Soils and Aggregates Section, the granular materials placed by MTO during the 2009 construction season can be summarized by the following:

1. A total of 8.835 million tonnes of granular aggregates were placed by MTO in 2009.
2. Of the total granular aggregates placed, the majority was placed in Northeastern and Central Regions (i.e. 39.7% and 23.0%, respectively).
3. Approximately 91.9%, or 8.12 million tonnes, of the granular aggregates placed were derived from natural sources (i.e. from pits or produced from crushed rock) while 8.1% came from RAP or RCM.
4. Of the 8.12 million tonnes of natural granular aggregates placed, 71.0% came from commercial sources, 18.8% came from within the ROW and the remainder (10.2%) came from non-commercial (i.e. unlicensed) sources.
5. Granular A and B (Types I, II, and III) represented 48.0% and 46.6%, respectively, of the total quantity of granular aggregates placed.
6. Almost all (i.e. 95.1%) of the recycled/reclaimed materials used by MTO in granular aggregates were placed in West and Central Region.
7. Of the 8.835 million tonnes of granular aggregates placed, approximately 39.3% or 3.47 million tonnes of the material was tested which represented a total of 577 lots.
8. Overall, 94.3% of the material placed was accepted at full price and 5.6% of the material was accepted at an adjusted price. Only one lot of Granular B type I was rejected.
9. Granular A had the most quality-related issues, with 22.1% of the lots tested receiving payment adjustments, while only 7.0% of the lots tested from all three types of Granular B (Types I, II, and II) received payment adjustments.
10. Payment adjustments amounted to approximately $450,000 in 2009.

6.0 - Acknowledgements

The Soils and Aggregates Section would like to acknowledge the Soils and Aggregates Quality Assurance Officers in each of the five Regional Quality Assurance Sections, who assembled and provided the QA Granular Summary Sheets and most of the other data that was used for these analyses. The authors would also like to acknowledge Darrin La Pointe for the final assembly of the tables and figures that are presented in this report.

7.0 - Reference

MTO “Aggregates for Granular O, A, B, M and Select Subgrade Materials”, Special Provision No. 110S13, Ministry of Transportation, 2007.

8.0 - Appendix A: Sources of Granular Aggregates Used by Each MTO Region During 2009

Granular A

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	534	849	280	865	225	2753
Non-Commercial Source	0	0	30	136	17	184
Material from Right of Way	0	0	0	558	23	582
Total Natural Aggregate	534	849	311	1560	265	3519
RAP	297	104	3	10	11	425
RCM	14	268	0	11	0	293
Glass/Ceramics	0	0	0	0	0	0
Other Recycled/Reclaimed Material	0	0	0	0	0	0
Total Recycled/Reclaimed Materials	311	372	3	21	11	718

Granular BI

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	878	0	0	314	0	1192
Non-Commercial Source	124	0	0	57	0	180
Material from Right of Way	0	0	0	104	0	104
Total Natural Aggregate	1001	0	0	475	0	1476
RAP	0	0	0	0	0	0
RCM	0	0	0	0	0	0
Glass/Ceramics	0	0	0	0	0	0
Other Recycled/Reclaimed Material	0	0	0	0	0	0
Total Recycled/Reclaimed Materials	0	0	0	0	0	0

Granular BII

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	61	27	362	108	25	583
Non-Commercial Source	0	0	0	305	0	305
Material from Right of Way	0	0	0	707	0	707
Total Natural Aggregate	61	27	362	1119	25	1595
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

Granular BIII

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	20	483	309	10	43	865
Non-Commercial Source	0	0	0	29	19	48
Material from Right of Way	0	130	0	0	8	137
Total Natural Aggregate	20	613	310	39	69	1050
RAP	0	0	0	0	0	0
RCM	0	0	0	0	0	0
Glass/Ceramics	0	0	0	0	0	0
Other Recycled Material	0	0	0	0	0	0
Total Recycled Materials	0	0	0	0	0	0

Granular O

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	0	0	83	0	0	83
Non-Commercial Source	0	0	0	0	0	0
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	0	0	83	0	0	83
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

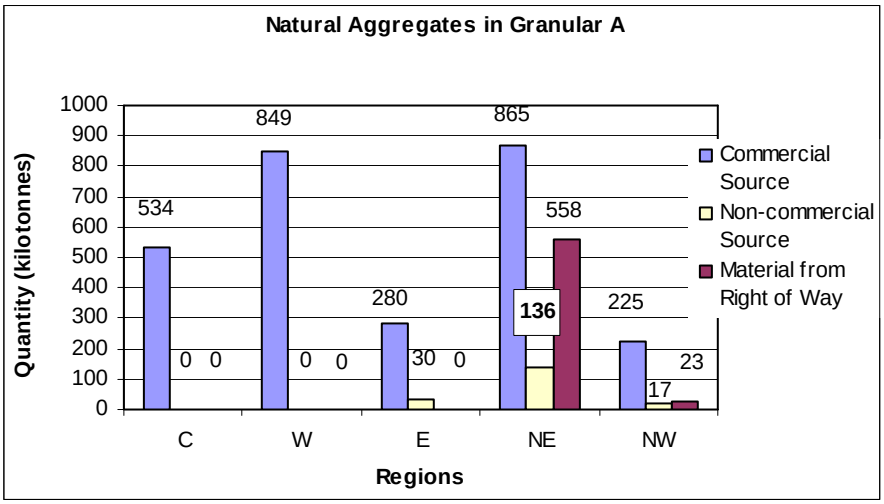
Granular M

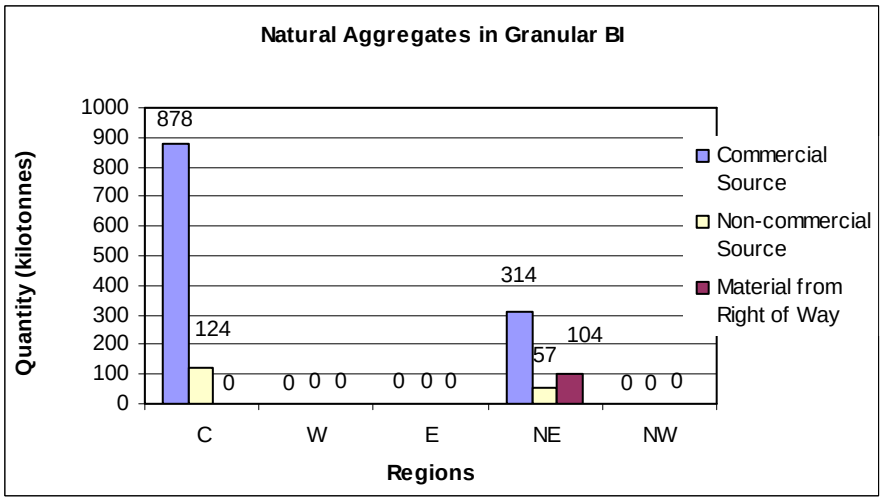
Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	0	0	0	8	0	8
Non-Commercial Source	0	0	0	0	0	0
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	0	0	0	8	0	8
RAP	0	0	0	0	0	0
RCM	0	0	0	0	0	0
Glass/Ceramics	0	0	0	0	0	0
Other Recycled/Reclaimed Material	0	0	0	0	0	0
Total Recycled/Reclaimed Materials	0	0	0	0	0	0

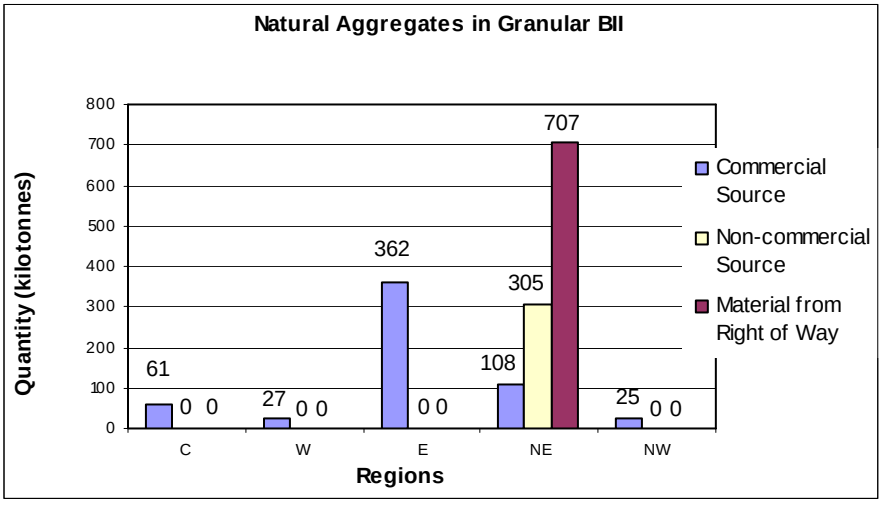
SSM

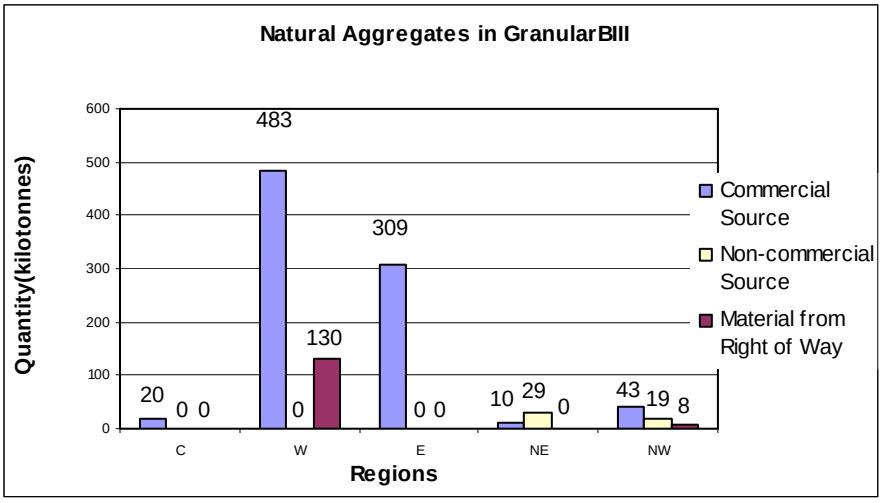
Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	103	0	0	173	0	276
Non-Commercial Source	0	0	0	108	0	108
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	103	0	0	281	0	385
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

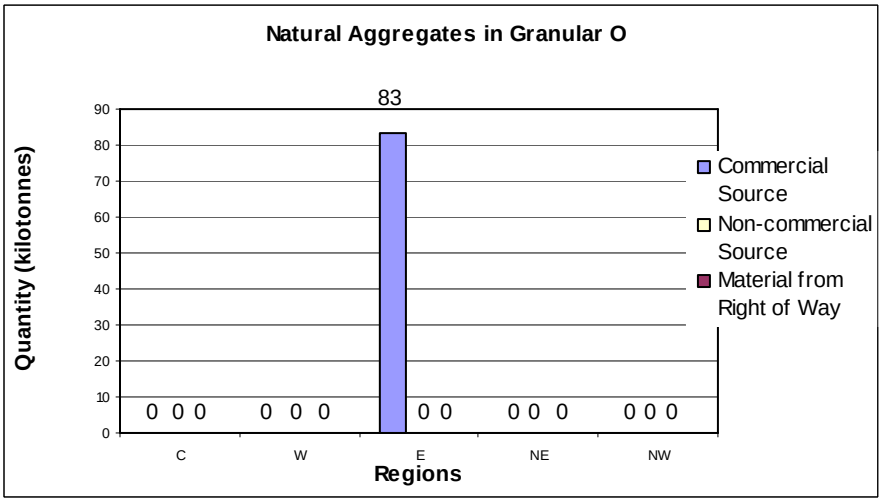
9.0 - Appendix B: Quantities of Natural Aggregates by Source Used in Granular Aggregates by Each MTO Region in 2009

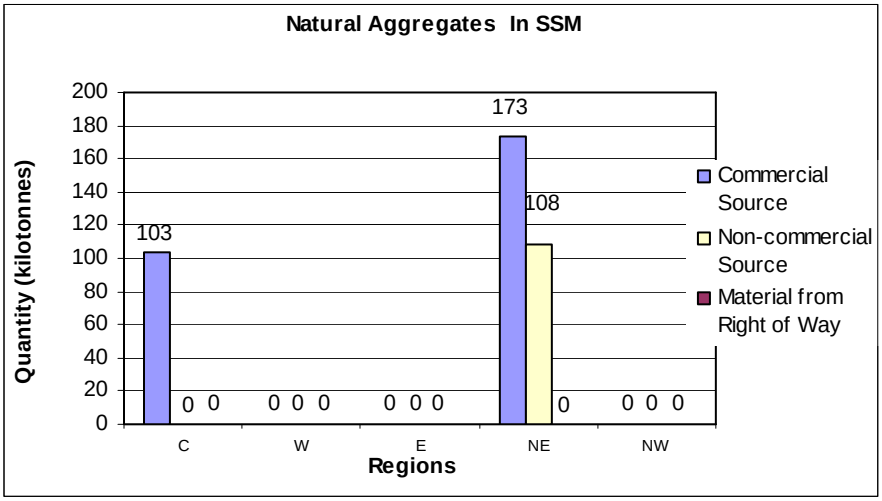


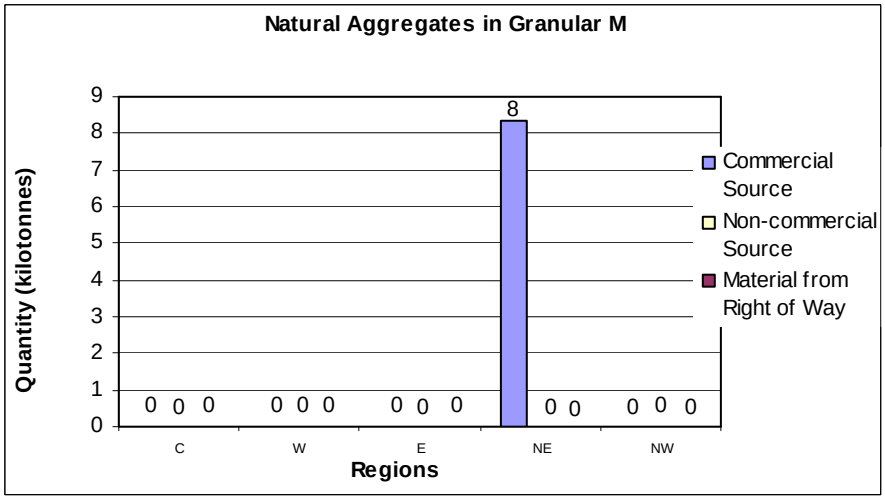



Natural Aggregates in Granular BII
Quantity (kilotonnes)
800
700
600
500
400
300
200
100
0
61
0 0
27
0 0
362
0 0
108
305
707
25
0 0
C
W
E
NE
NW
Regions
Commercial Source
Non-commercial Source
Material from Right of Way


Natural Aggregates in GranularBIII
Quantity(kilotonnes)
600
500
400
300
200
100
0
20
0 0
483
0
130
309
0 0
10
29
0
43
19
8
C
W
E
NE
NW
Regions
Commercial Source
Non-commercial Source
Material from Right of Way

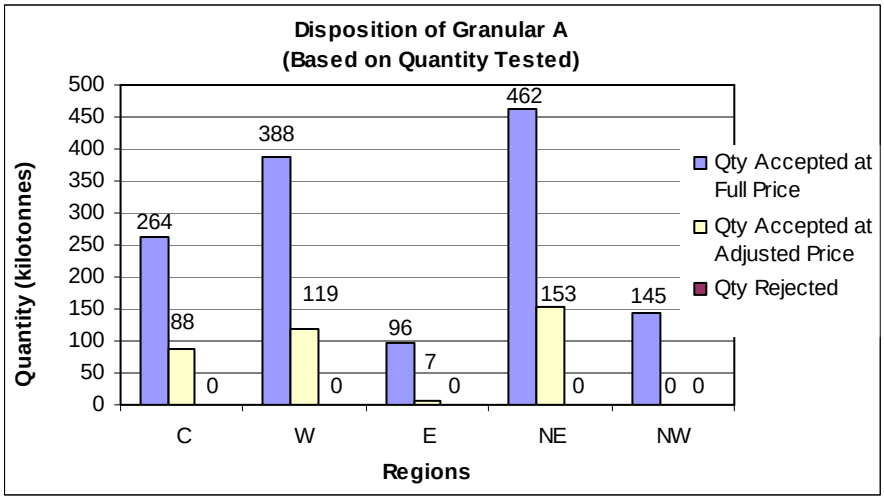

Natural Aggregates in Granular O
Quantity (kilotonnes)
90
80
70
60
50
40
30
20
10
0
0 0 0
0 0 0
83
0 0
0 0 0
0 0 0
C
W
E
NE
NW
Regions
Commercial Source
Non-commercial Source
Material from Right of Way

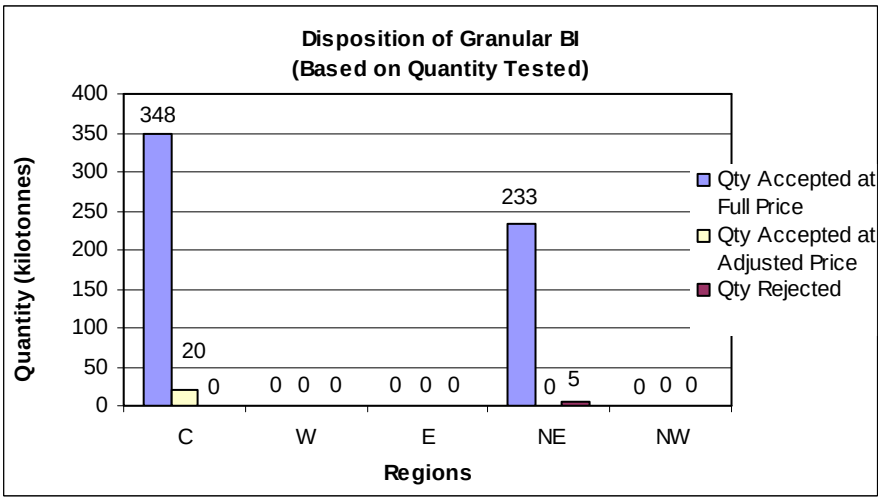

Natural Aggregates In SSM
Quantity (kilotonnes)
200
180
160
140
120
100
80
60
40
20
0
103
0 0
0 0 0
0 0 0
173
108
0
0 0 0
C
W
E
NE
NW
Regions
Commercial Source
Non-commercial Source
Material from Right of Way

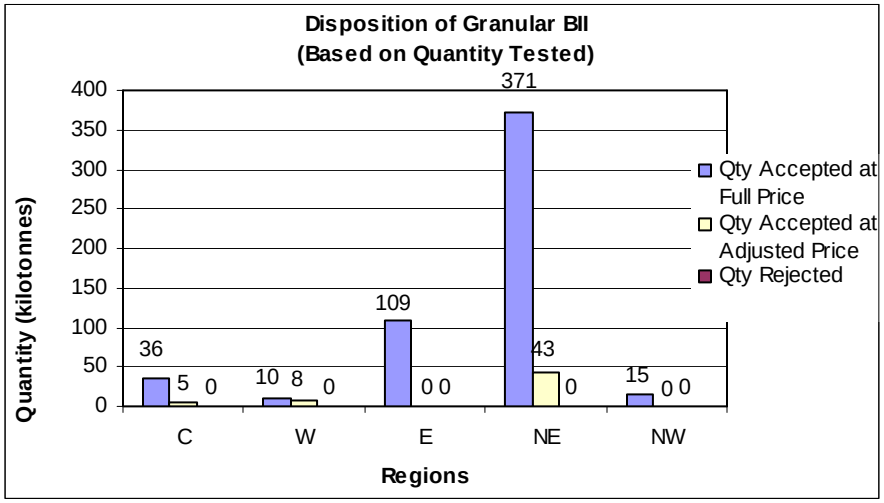

Natural Aggregates in Granular M
Quantity (kilotonnes)
9
8
7
6
5
4
3
2
1
0
0 0 0
0 0 0
0 0 0
8
0 0
0 0 0
C
W
E
NE
NW
Regions
Commercial Source
Non-commercial Source
Material from Right of Way

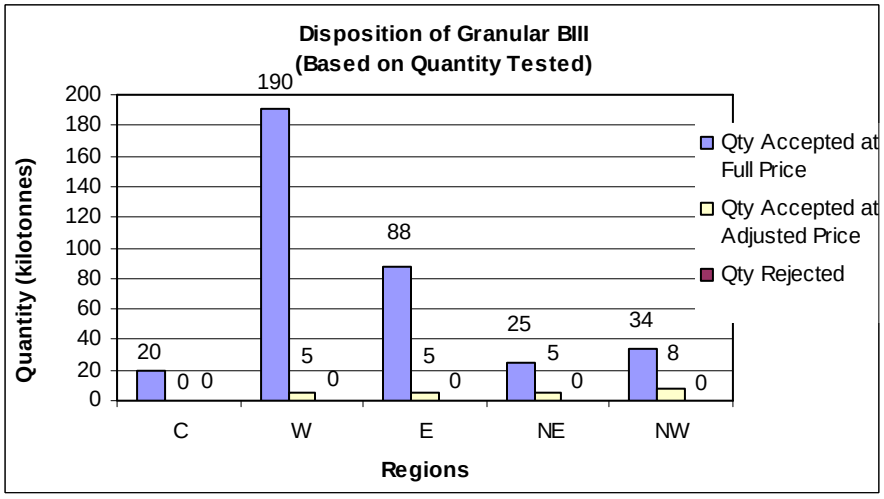
10.0 - Appendix C: Disposition of QA Lots of Granular Aggregates Tested in Each MTO Region in 2009

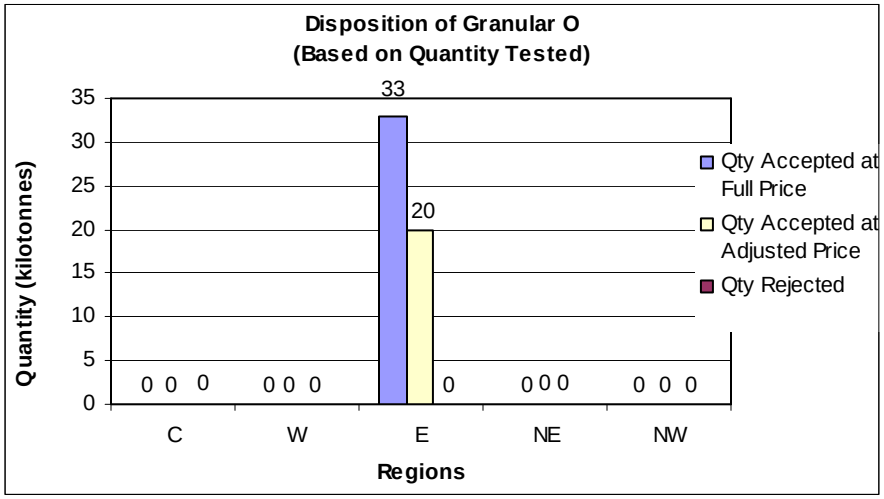
10.1 - DISPOSITION BASED ON QUANTITIES WITHIN THE LOTS TESTED

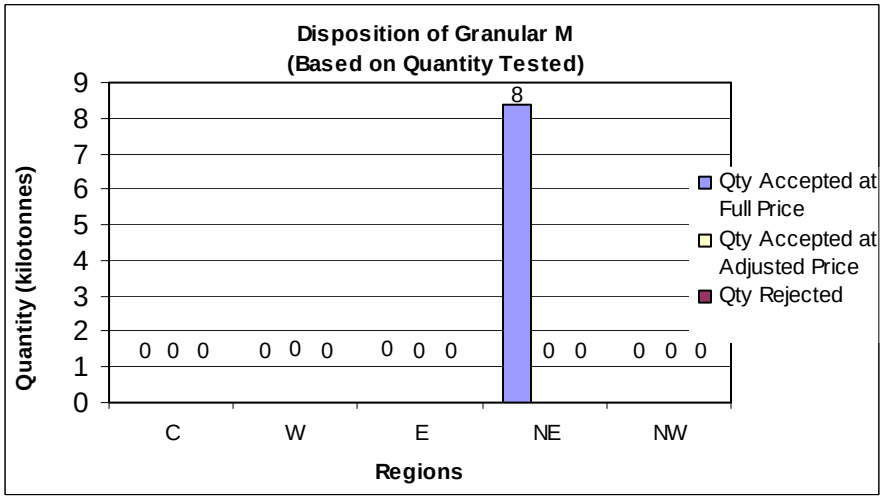


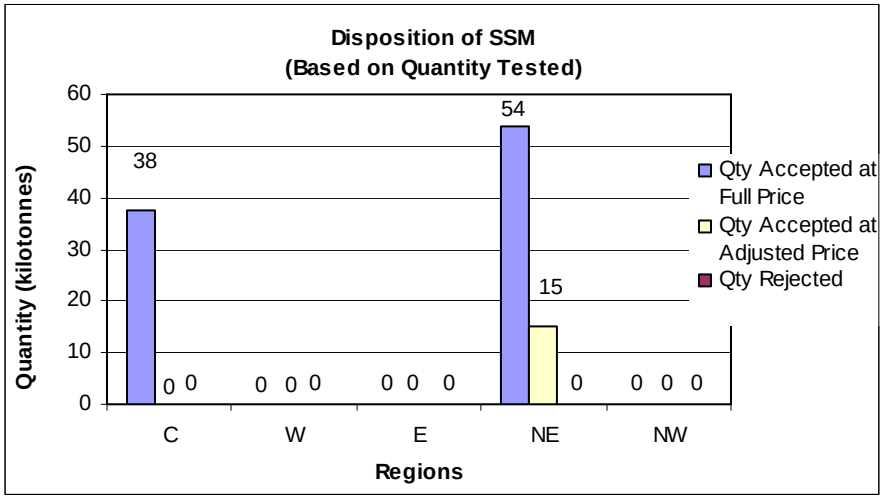



Disposition of Granular BII
(Based on Quantity Tested)
Quantity (kilotonnes)
400
350
300
250
200
150
100
50
0
36
5
0
10
8
0
109
0
0
371
43
0
15
0
0
C
W
E
NE
NW
Regions
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected

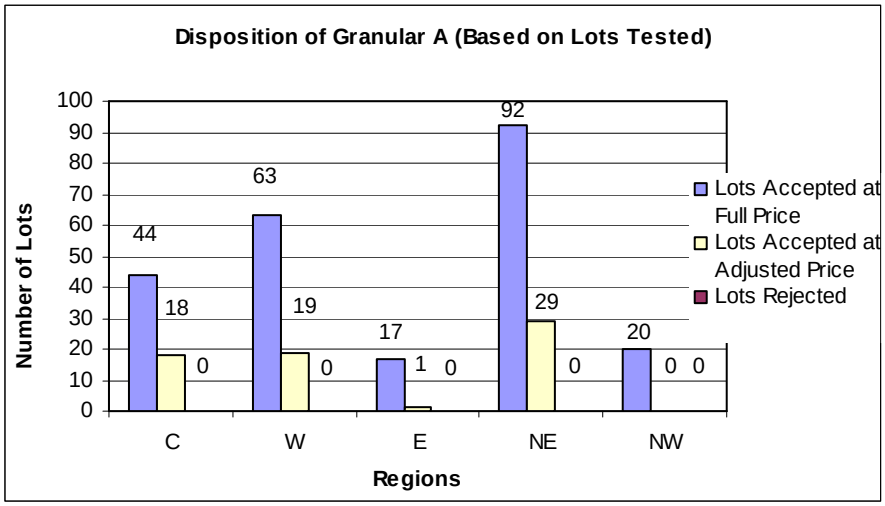

Disposition of Granular BIII
(Based on Quantity Tested)
Quantity (kilotonnes)
200
180
160
140
120
100
80
60
40
20
0
20
0
0
190
5
0
88
5
0
25
5
0
34
8
0
C
W
E
NE
NW
Regions
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected

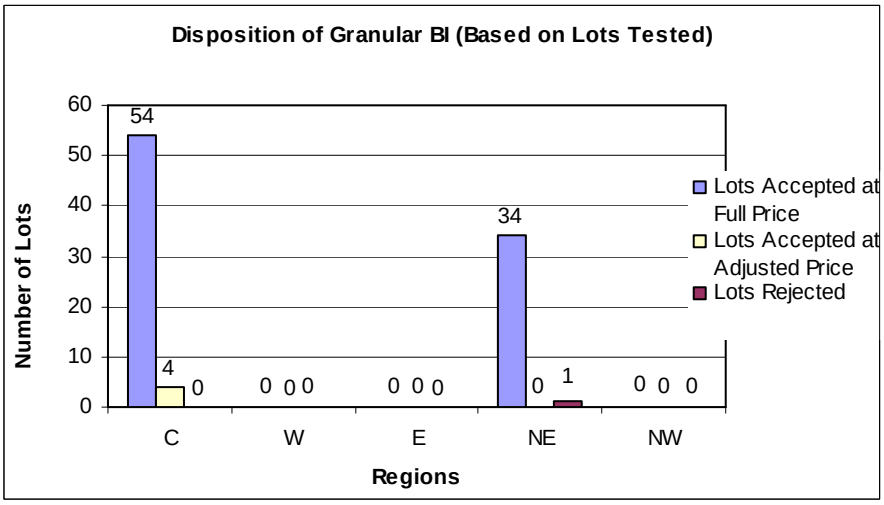

Disposition of Granular O
(Based on Quantity Tested)
Quantity (kilotonnes)
35
30
25
20
15
10
5
0
33
20
0 0 0
0 0 0
0
0 0 0
0 0 0
C
W
E
NE
NW
Regions
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected

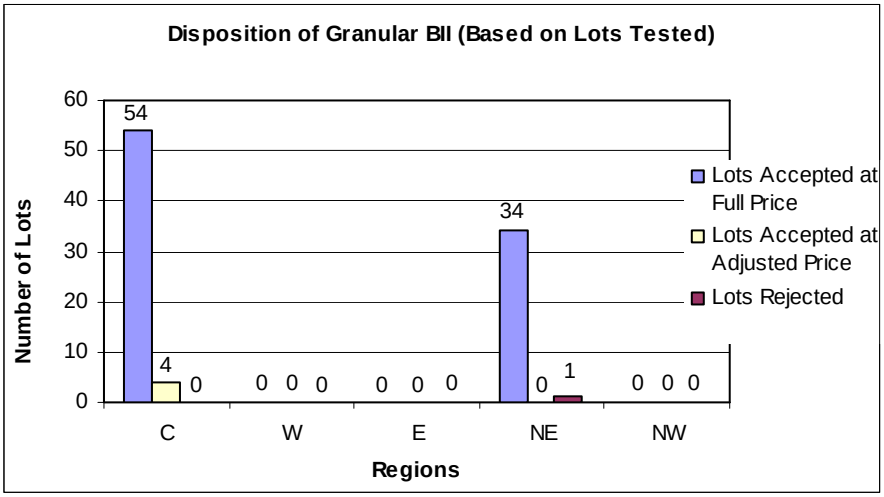

Disposition of Granular M
(Based on Quantity Tested)
Quantity (kilotonnes)
9
8
7
6
5
4
3
2
1
0
8
0 0 0
0 0 0
0 0 0
0 0
0 0 0
C
W
E
NE
NW
Regions
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected

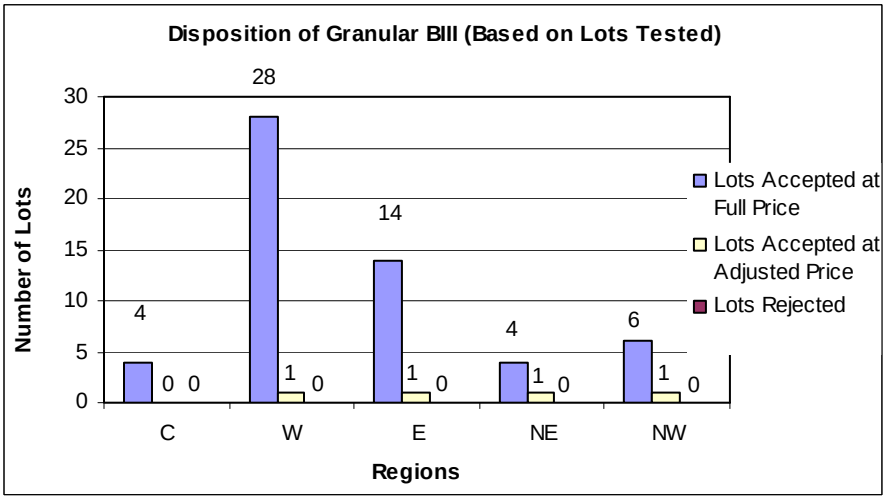

Disposition of SSM
(Based on Quantity Tested)
Quantity (kilotonnes)
60
50
40
30
20
10
0
38
0 0
0 0 0
0 0 0
54
15
0
0 0 0
C
W
E
NE
NW
Regions
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected

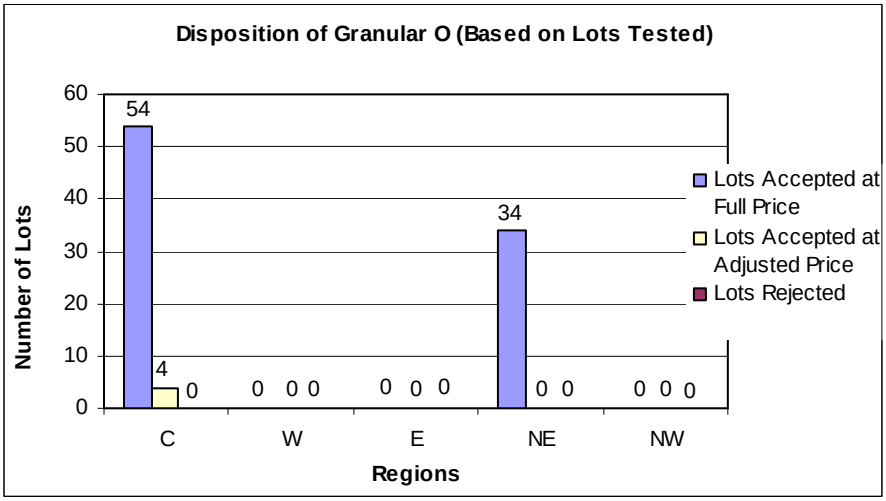
10.2 - DISPOSITION BASED ON NUMBER OF LOTS TESTED

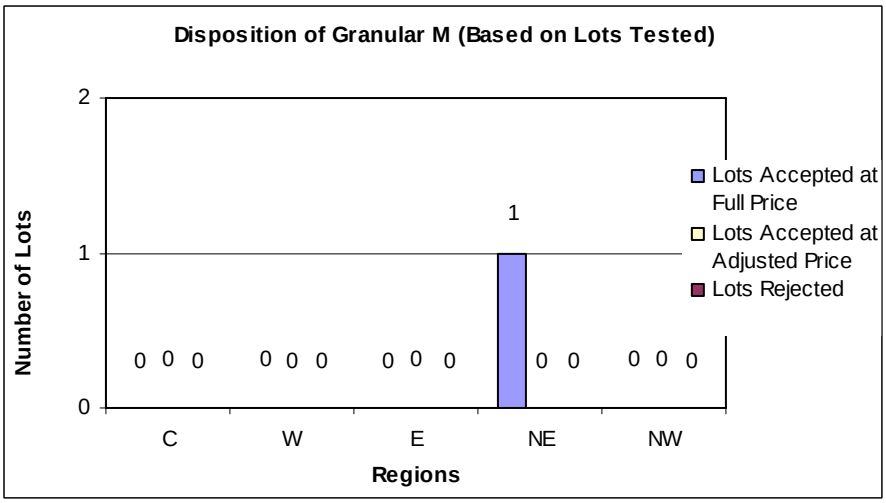


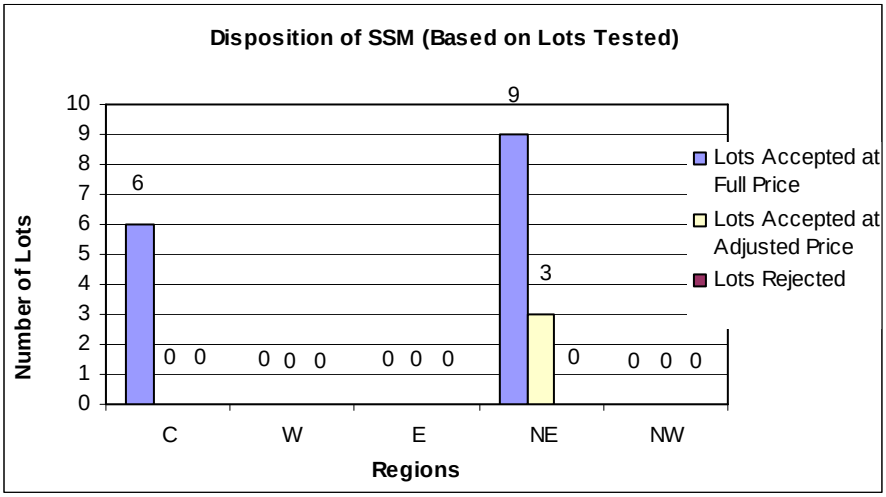



Disposition of Granular BII (Based on Lots Tested)
Number of Lots
60
50
40
30
20
10
0
54
4
0
0 0 0
0 0 0
34
0
1
0 0 0
C
W
E
NE
NW
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected


Disposition of Granular BIII (Based on Lots Tested)
Number of Lots
30
25
20
15
10
5
0
4
0 0
28
1
0
14
1
0
4
1
0
6
1
0
C
W
E
NE
NW
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected


Disposition of Granular O (Based on Lots Tested)
Number of Lots
60
50
40
30
20
10
0
54
4
0
0 0 0
0 0 0
34
0 0
0 0 0
C
W
E
NE
NW
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected


Disposition of Granular M (Based on Lots Tested)
Number of Lots
2
1
0
0 0 0
0 0 0
0 0 0
1
0 0
0 0 0
C
W
E
NE
NW
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected


Disposition of SSM (Based on Lots Tested)
Number of Lots
Regions
C
W
E
NE
NW
6
0 0
0 0 0
0 0 0
9
3
0
0 0 0
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected

11.0 - Appendix D: Lot Summary of Granular Aggregates Tested by Each Region in 2009

Granular A

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	62	82	18	121	20	303
Qty Tested (kt)	352	507	103	614	145	1721
Lots Accepted at Full Price	44	63	17	92	20	236
Qty Accepted at Full Price (kt)	264	388	96	462	145	1355
Lots Accepted at Adjusted Price	18	19	1	29	0	67
Qty Accepted at Adjusted Price (kt)	88	119	7	153	0	367
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular BI

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	58	N/A	N/A	35	N/A	93
Qty Tested (kt)	368	N/A	N/A	238	N/A	606
Lots Accepted at Full Price	54	N/A	N/A	34	N/A	88
Qty Accepted at Full Price (kt)	348	N/A	N/A	233	N/A	581
Lots Accepted at Adjusted Price	4	N/A	N/A	0	N/A	4
Qty Accepted at Adjusted Price (kt)	20	N/A	N/A	0	N/A	20
Lots Rejected	0	N/A	N/A	1	N/A	1
Qty Rejected (kt)	0	N/A	N/A	5	N/A	5

Granular BII

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	10	4	16	58	3	91
Qty Tested (kt)	41	17	109	413	15	596
Lots Accepted at Full Price	9	3	16	51	3	82
Qty Accepted at Full Price (kt)	36	10	109	371	15	541
Lots Accepted at Adjusted Price	1	1	0	7	0	9
Qty Accepted at Adjusted Price (kt)	5	8	0	43	0	55
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular BIII

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	4	29	15	5	7	60
Qty Tested (kt)	20	195	93	30	41	380
Lots Accepted at Full Price	4	28	14	4	6	56
Qty Accepted at Full Price (kt)	20	190	88	25	34	357
Lots Accepted at Adjusted Price	0	1	1	1	1	4
Qty Accepted at Adjusted Price (kt)	0	5	5	5	8	23
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular O

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	N/A	N/A	11	N/A	N/A	11
Qty Tested (kt)	N/A	N/A	53	N/A	N/A	53
Lots Accepted at Full Price	N/A	N/A	7	N/A	N/A	7
Qty Accepted at Full Price (kt)	N/A	N/A	33	N/A	N/A	33
Lots Accepted at Adjusted Price	N/A	N/A	4	N/A	N/A	4
Qty Accepted at Adjusted Price (kt)	N/A	N/A	20	N/A	N/A	20
Lots Rejected	N/A	N/A	0	N/A	N/A	0
Qty Rejected (kt)	N/A	N/A	0	N/A	N/A	0

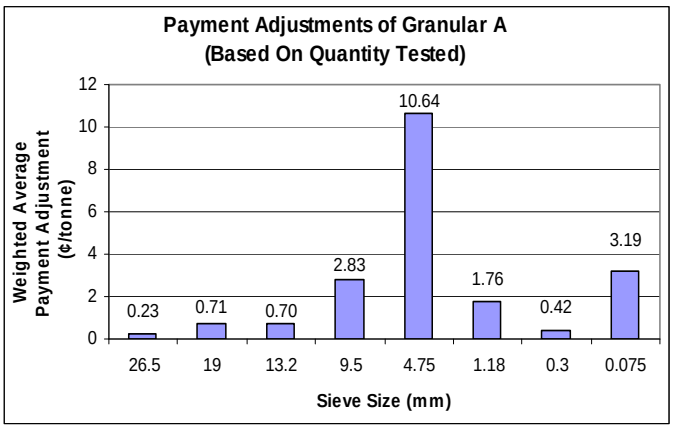
Granular M

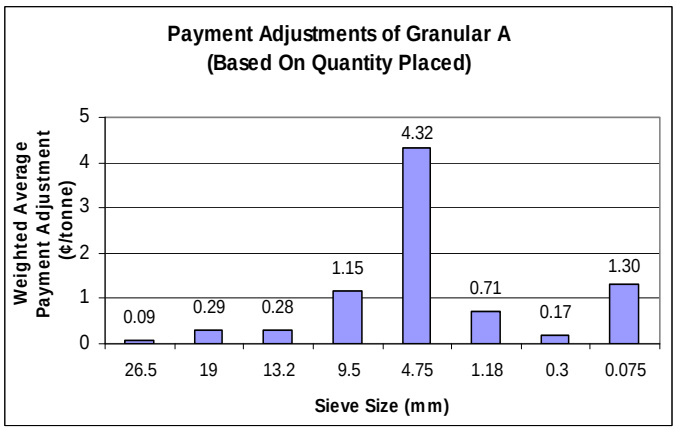
Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	N/A	N/A	N/A	1	N/A	1
Qty Tested (kt)	N/A	N/A	N/A	8	N/A	8
Lots Accepted at Full Price	N/A	N/A	N/A	1	N/A	1
Qty Accepted at Full Price (kt)	N/A	N/A	N/A	8	N/A	8
Lots Accepted at Adjusted Price	N/A	N/A	N/A	0	N/A	0
Qty Accepted at Adjusted Price (kt)	N/A	N/A	N/A	0	N/A	0
Lots Rejected	N/A	N/A	N/A	0	N/A	0
Qty Rejected (kt)	N/A	N/A	N/A	0	N/A	0

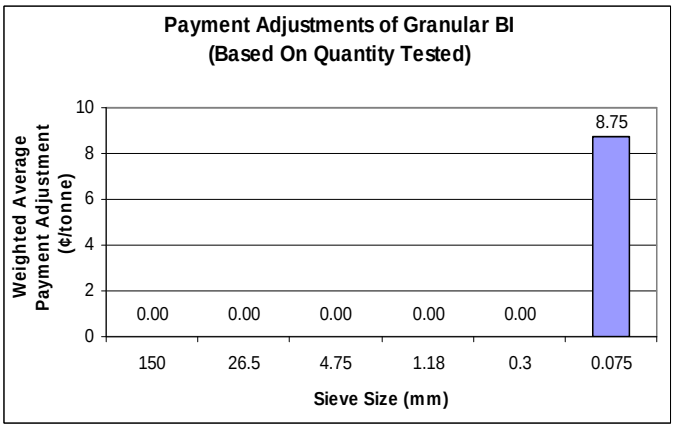
SSM

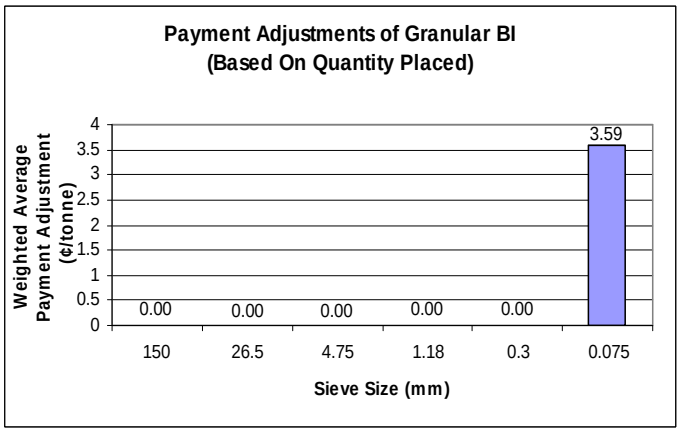
Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	6	N/A	N/A	12	N/A	18
Qty Tested (kt)	38	N/A	N/A	69	N/A	106
Lots Accepted at Full Price	6	N/A	N/A	9	N/A	15
Qty Accepted at Full Price (kt)	38	N/A	N/A	54	N/A	91
Lots Accepted at Adjusted Price	0	N/A	N/A	3	N/A	3
Qty Accepted at Adjusted Price (kt)	0	N/A	N/A	15	N/A	15
Lots Rejected	0	N/A	N/A	0	N/A	0
Qty Rejected (kt)	0	N/A	N/A	0	N/A	0

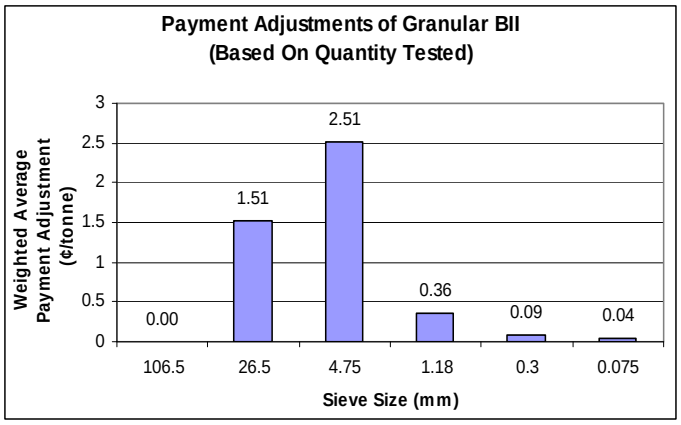
12.0 - Appendix E: Summary of Weighted Average Payment Adjustments for Quantities Tested and Quantities Placed in 2009 (¢/tonne)

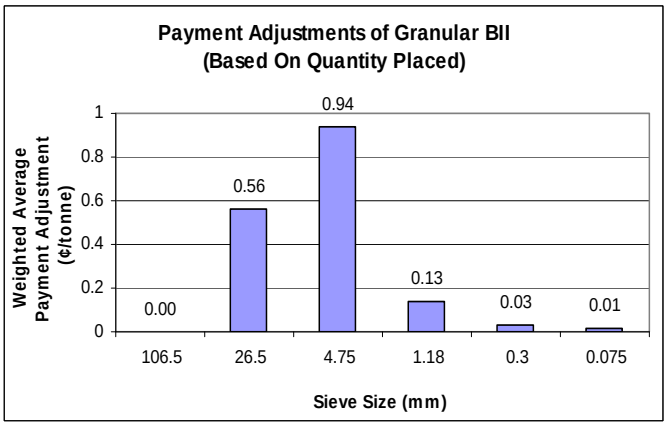


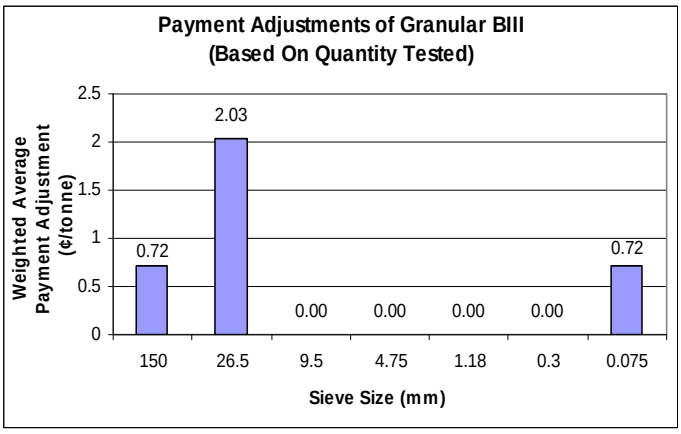


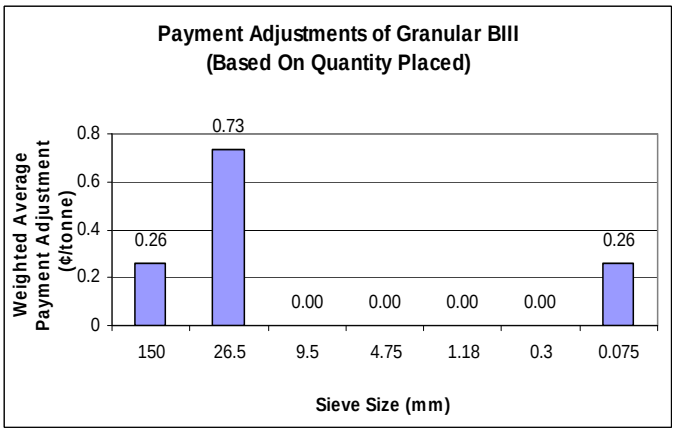


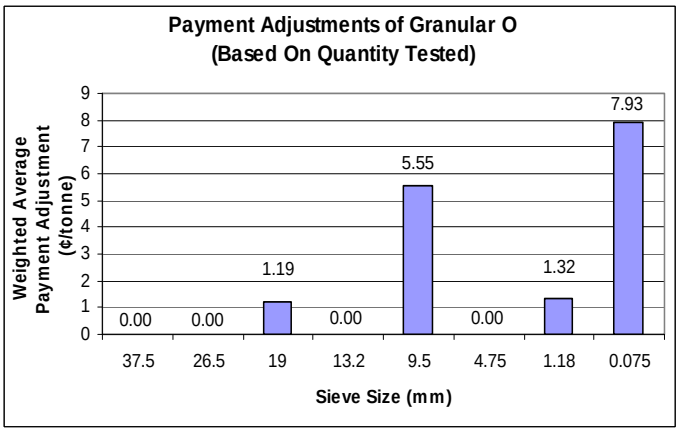


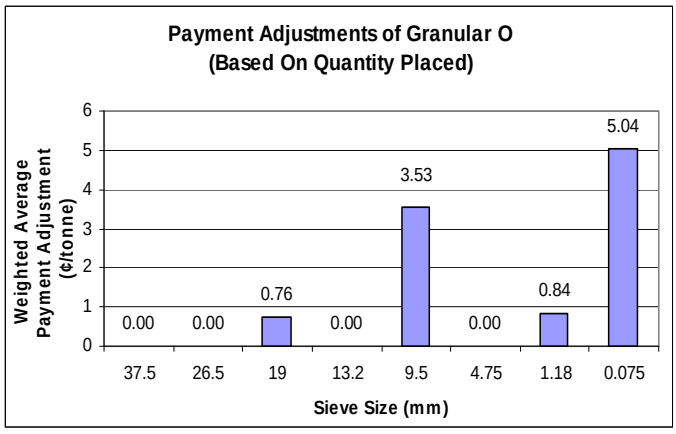

Payment Adjustments of Granular BII
(Based On Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
0.00
1.51
2.51
0.36
0.09
0.04
106.5
26.5
4.75
1.18
0.3
0.075
Sieve Size (mm)

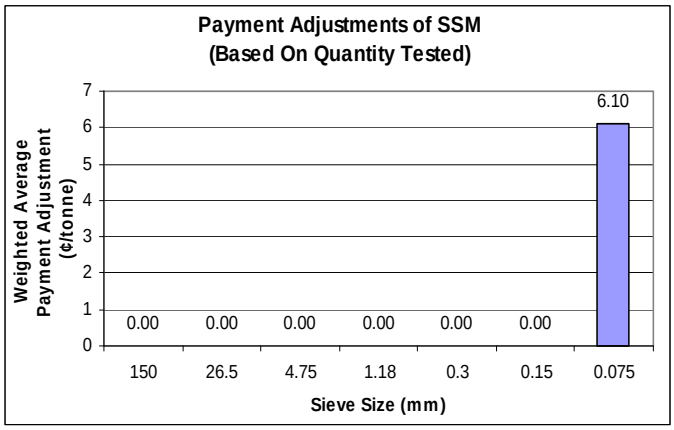

Payment Adjustments of Granular BII
(Based On Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
0.00
0.56
0.94
0.13
0.03
0.01
106.5
26.5
4.75
1.18
0.3
0.075
Sieve Size (mm)

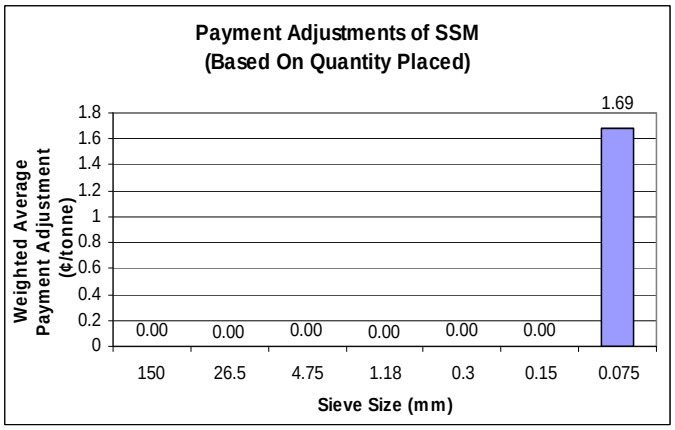

Payment Adjustments of Granular BIII
(Based On Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
0.72
2.03
0.00
0.00
0.00
0.00
0.72
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Payment Adjustments of Granular BIII
(Based On Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
0.26
0.73
0.00
0.00
0.00
0.00
0.26
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Payment Adjustments of Granular O
(Based On Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
0.00
0.00
1.19
0.00
5.55
0.00
1.32
7.93
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)


Payment Adjustments of Granular O
(Based On Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
0.00
0.00
0.76
0.00
3.53
0.00
0.84
5.04
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)


Payment Adjustments of SSM
(Based On Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
7
6
5
4
3
2
1
0
6.10
0.00
0.00
0.00
0.00
0.00
0.00
150
26.5
4.75
1.18
0.3
0.15
0.075
Sieve Size (mm)


Payment Adjustments of SSM
(Based On Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1.69
0.00
0.00
0.00
0.00
0.00
0.00
150
26.5
4.75
1.18
0.3
0.15
0.075
Sieve Size (mm)