PCA Portland Cement Association
THE Monitor Flash Report
September 20, 2005
Breaking Analysis of the Economy, Construction and Cement Industries
Contact: > Ed Sullivan, Chief Economist 847.972.9006 > esullivan@cement.org

Hurricane Katrina

Overview

Katrina made its first landfall in southern Florida and again at the Gulfport-Biloxi area of Mississippi before heading into the Ohio Valley. The bulk of Katrina's damages were concentrated along the Gulf Coast of Louisiana, Mississippi, and the western coast of Alabama. Ten metropolitan areas along the Gulf Coast were impacted by Katrina – seven in Louisiana, two in Mississippi, and one in Alabama. Preliminary estimates put property damage estimates in excess of $125 billion, marking Katrina as the most devastating hurricane in U.S. history.

While recognizing the human tragedy involved, this report serves as a quick assessment of the potential impact on U.S. cement markets in the wake of Hurricane Katrina. Based on information available, this report assesses two main areas of importance: 1) the potential overall impact of Katrina on cement demand and 2) potential cement supply disruptions. Information regarding the full effects of damages is still relatively unclear, and the conclusions reached in this report are tentative.

Most Damaging Hurricanes 1972-2005

Rank	Name	Year	Date	Landfall Category	Landfall	Damage 2000 $ (millions)
1	Katrina	2005	28-Aug	4	Florida/Alabama/Louisiana/ Mississippi	110.0 +
2	Andrew	1992	24-Aug	5	Florida/Louisiana	35.0
3	Charley	2004	13-Aug	4	Florida	13.2
4	Hugo	1989	22-Sep	4	South Carolina	9.7
5	Agnes	1972	19-Jun	1	Florida, Northeast	8.6
6	Frederic	1979	9-Sep	3	Alabama/Mississippi	5.0
7	Floyd	1999	15-Aug	2	Mid-Atlantic	4.7
8	Fran	1996	8-Sep	3	North Carolina	3.7
9	Opal	1995	4-Oct	3	Florida/Alabama	3.5
10	Alicia	1983	18-Aug	3	Texas	3.4
11	Georges	1998	26-Sep	2	Florida/Mississippi/Alabama	2.5
12	Juan	1985	29-Sep	1	Louisiana	2.4
13	Elena	1985	2-Sep	3	Florida/Mississippi/Alabama	2.0

Cement Supply Impacts

Point 1. Katrina reduced domestic cement production slightly.

Six cement plants operate in the hurricane affected area, accounting for 5.8 million tons of annual capacity. No hurricane damage has been reported to any of the cement plants. Two plants shut down their kilns as a precautionary move prior to Katrina's landfall. Both plants were shut down August 27 and returned on-line within a few days. The shutdowns accounted for an extremely small portion of total United States' cement supply, 15,000 tons or 0.02% of the nation's total. For the tri-state hurricane region, the lost production accounts for 0.3% of total supply.

Point 2. Katrina's impact on regional supply caused by damage to the region's import terminals is relatively small.

Unlike the area's cement plants, import terminals are generally located on water and vulnerable to storm damage. Twenty import terminals operate in the hurricane-affected region, accounting for roughly 4.9 million tons of annual throughput. Ten import terminals were affected. In most cases, the terminals were shut down because of either power failure or other minor disruptions. Three located in New Orleans received serious water damage. In addition, some on-site stored cement was also lost. Including estimates for continued downtime, Hurricane Katrina reduced annual import throughput by 200,000 tons.

Reduced throughput does not necessarily equal lost supply. In some cases, barge traffic can be diverted to other nearby import terminals – negating the impact of a damaged terminal. The three damaged New Orleans terminals account for roughly one-third of the entire disruption. In each instance, the affected company has several alternative terminals nearby that can absorb the lost throughput. Given the general disruption to river traffic, unaffected terminals will likely have sufficient capacity to handle diverted traffic. The adverse impact on supply from damaged import terminals is relatively small.

Point 3. Disruption of river traffic will amplify the adverse impact on import supplies.

Next to Tampa, Florida, the port of New Orleans was the nation's busiest cement import terminal. In 2004, 2.6 million tons of cement passed through the port of New Orleans, accounting for nearly 10% of the nation's total cement imports. Prior to the hurricane, New Orleans was on pace to import 3.6 million tons or 11% of the nation's total. As the gateway to the Mississippi River, the port supplies goods to nine states along the river.

Water depths and bridge heights prevent deep draft vessels from traveling above Baton Rouge. Typically, cement imports are off-loaded onto barges by a process called "mid-streaming." According to various reports, equipment associated with the transfer and cleaning of barges were damaged by the storm. This reduces the ability to load cement barges, creating a bottleneck in the flow of cement via barge on the Mississippi. In addition, according to various reports, silt and debris from the hurricane has hindered barge traffic along the Mississippi. Free flow of traffic on the Mississippi is

not expected to resume for several months. Depending upon the rate of river clean-up, PCA estimates that the hindrance of water traffic could cause a disruption of cement import supply of 400,000 to 500,000 tons.

Some shipping traffic destined for New Orleans, however, has been diverted to other Gulf ports in Texas and Florida. Much of this cement has entered the local markets – adding supply. These markets are among the tightest markets in the country. While it's unlikely that the additional supply will completely relieve tight market conditions in these states, some temporary improvement is likely.

Point 4. Damage to the regional rail system will compound problems moving cement to targeted markets.

Disruption in cement supplies will be compounded by damage to the regional railroad system. The length of disruption to regional rail traffic will determine the extent of any potential cement supply disruption. Roughly 50% of all cement sourced from a plant or terminal uses a rail carrier – making this a critical logistical disruption to the industry. To deal with this problem, cement companies have relied heavily on truck transport. Given the magnitude of tonnage handled by the railroads, however, trucking offers only a partial solution. Considering the likely regional flow of cement and the capabilities of increased trucking, PCA estimates rail disruptions could lead to another 250,000 ton supply disruption.

Point 5. Import supply disruptions will be dispersed over a multi-state region, diminishing the supply impact for any one state.

All totaled, supply interruptions arising from Katrina could amount to more than 700,000 tons. The adverse impacts of this disruption will be spread throughout a multi-state region, diminishing the supply impact for any one state.

Cement imports arriving through the port of New Orleans can theoretically travel by barge up the entire Mississippi and branch out to the Ohio and Missouri river. While data exists regarding the volume of tonnage entering a port, no information exists regarding the movement of cement after clearing customs. As a result, the regional market where imported cement finally ends up is subject to speculation – not fact. PCA's estimates regarding the import supply impact by state is based on import terminal capacities and assessments regarding the source of imports from New Orleans.

Imports to states along the northern Mississippi, such as Wisconsin, Minnesota, Illinois, and Iowa, are more likely to be supplied via the Great Lakes. In addition, beginning in southern Illinois, a concentration of domestic plants exists – further reducing the likely flow of imports from New Orleans to northern Mississippi River states. PCA estimates that roughly 25% to 33% of imports arriving through the port of New Orleans makes its way to the northern Mississippi states. That implies a 175,000 to a 225,000 ton supply disruption. Cement consumption among the four states comprising the northern Mississippi River region totaled 10.3 million metric tons. The supply disruption to the northern Mississippi River region accounts for 1.7% to 2.3% of total regional market supply.

Imports to the southern and middle Mississippi River regions account for the lion's share of New Orleans cement imports. PCA estimates that 67% to 75% of imports arriving

through the port of New Orleans makes its way to the southern and middle Mississippi River area. Based on this assessment, that implies a 475,000 to a 525,000 ton supply disruption. Cement consumption among the six states comprising the lower and middle Mississippi River region totaled 10.6 million metric tons. The supply disruption to the southern Mississippi River region accounts for 4.5% to 5.0% of total regional market supply.

Cement Demand Impacts: Florida, Mississippi, and Alabama

Point 1. Storm-affected areas of Mississippi, Alabama, and Florida account for a relatively small portion of each state's overall cement market.

Within each state, Katrina's wind velocity and storm surge activity by county was correlated with the size of county cement markets. This analysis reveals that nearly 80% of Florida and Alabama's cement market was unaffected by the storm. A considerably smaller portion of Mississippi's cement market was unaffected (37%).

Storm damage associated with Category 2 wind velocity or lower accounted for all of Florida's impact (22% of the total state market) and a significant portion of Mississippi's impact (26% of the total state market). Lower wind velocity is associated with lower property damage and cement-oriented repairs once the clean-up period is over.

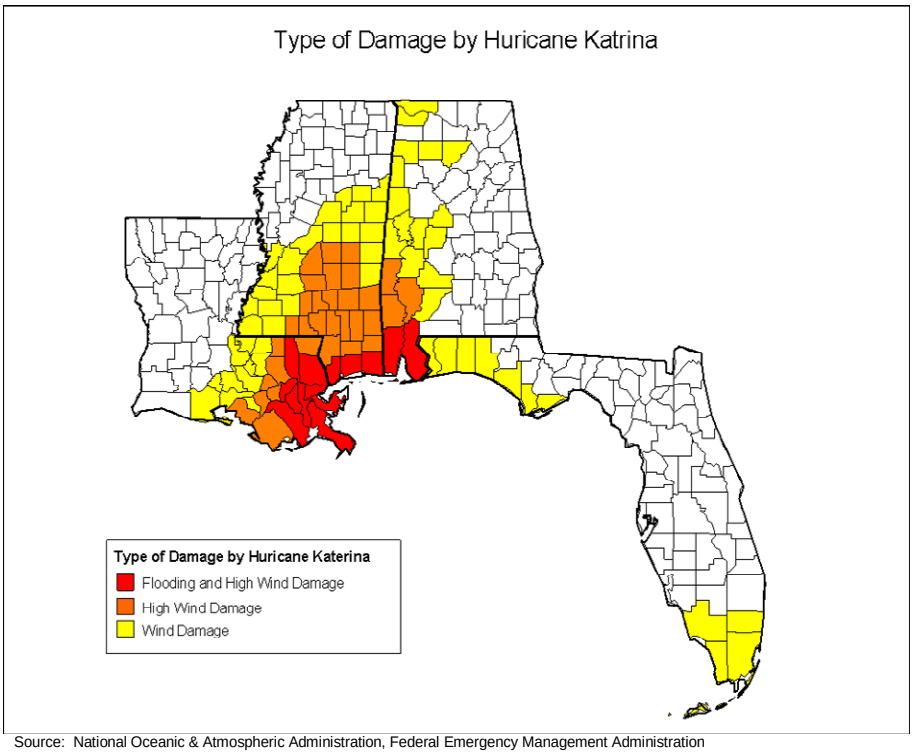
Percent of Cement Consumption Impacted by Katrina

	Florida	Alabama	Mississippi
Water & high wind damage	0.0%	14.1%	16.1%
High wind damage	0.0%	0.8%	20.2%
Other wind damage	22.0%	7.5%	26.8%
Unaffected by storm	78.0%	77.6%	36.9%

Point 2. The clean-up period and depressed cement consumption is expected to be relatively short lived in the storm-affected areas of Mississippi, Alabama, and Florida.

Based upon PCA's assessment of the last 13 major hurricanes that have made landfall in the U.S. during the past 30 years, a region impacted by a hurricane endures a stage in which construction activity and cement consumption is depressed immediately following the storm. Depressed consumption is a result of clean-up efforts that must take place before the market can return to normal construction activity.

For all hurricanes during 1972-2004, the average cleanup period lasted 2.5 months. The length of the clean-up period, however, varies from each hurricane and is generally correlated with the wind velocity of each hurricane measured by Saffir-Simpson index. The Saffir-Simpson index rankings spread from a category 1 (mildest) to 5 (most severe). The presence of tidal surges also played a critical role in determining the length of clean-up periods.



Source: National Oceanic & Atmospheric Administration, Federal Emergency Management Administration

For areas that experienced high winds (category 3 & 4) and tidal surges, PCA assumed a clean-up period of four months. This is consistent with the experience of Hurricane Hugo. Areas that experienced high winds only were assumed to have a three-month

clean-up period. Counties that encountered winds in category 2 or less were assumed to have a 2.5 month clean-up period. This is consistent with the average clean-up period of major hurricanes from 1972 to 2004.

Katrina-effected regions experienced a variety of wind forces. In addition, some areas were impacted by tidal surges. Wind and tidal surge conditions were identified by county within each state based on national weather service information. The following table reflects the proportion of state consumption affected by each type of storm damage and the assumption regarding clean-up period.

Point 3. PCA estimates that cement consumption in the tri-state area will be marginally reduced during the clean-up period.

Given the relatively small portion of state markets affected and the relatively short period expected for clean-up, the adverse impact on cement consumption in the tri-state region is expected to be fairly low. According to PCA estimates, Hurricane Katrina will depress cement consumption by roughly 76,000 tons in hurricane-affected areas during the clean-up period stretching from September through December. This reflects an 11% decline in the total tri-state hurricane-affected region.

Damage Type and Length of Clean-up Period By State

	Share of Hurricane Affected Area	Months Clean-up Period
Florida		
High Wind & Water	0.0%	0
High Wind Damage	0.0%	0
Other Wind	22.0%	2.5
Unaffected	78.0%	0
Alabama		
High Wind & Water	14.1%	4
High Wind Damage	0.8%	3
Other Wind	7.5%	2.5
Unaffected	77.6%	0
Mississippi		
High Wind & Water	16.1%	4
High Wind Damage	20.2%	3
Other Wind	26.8%	2.5
Unaffected	36.9%	0

Point 4. Once clean-up is complete, PCA expects a period of accelerated cement consumption.

Once clean-up operations are complete, cement consumption accelerates above trend levels. Accelerated consumption is a result of pent-up demand for normal construction and additional demand associated with repairs to property.

The average clean-up period for the tri-state area is expected to range between 2.5 and 4 months depending upon the type of storm conditions encountered. Since the length of the clean-up period is dependent upon the degree and type of damage encountered, some counties will finish clean-up activity prior to others – enabling accelerated construction activity to materialize sooner. Accelerated construction is expected to begin earliest in areas affected by lower hurricane force winds (November) and latest in areas affected by higher velocity winds and tidal surges (January 2006). The following table reflects the proportion of state cement consumption affected by each type of storm damage and the assumption regarding the length of accelerated consumption.

Damage Type and Length of Accelerated Consumption Period By State

	Share of Hurricane Affected Area	Accelerated Consumption Period
Florida		
High Wind & Water	0.0%	0
High Wind Damage	0.0%	0
Other Wind	22.0%	2.5
Unaffected	78.0%	0
Alabama		
High Wind & Water	14.1%	5.0
High Wind Damage	0.8%	4.0
Other Wind	7.5%	2.5
Unaffected	77.6%	0.0
Mississippi		
High Wind & Water	16.1%	5.0
High Wind Damage	20.2%	4.0
Other Wind	26.8%	2.5
Unaffected	36.9%	0.0

Point 5. PCA estimates that accelerated cement consumption in the tri-state region will be relatively modest.

Wind and tidal surges contributed to the destructive nature of Katrina in hurricane affected areas of Florida, Mississippi, and Alabama. High winds cause greater damage to the upper portions (roofs) of structures than at the bottom of structures (foundations). Since concrete usage in construction is more common at foundations and lower levels of building, it is likely that the cement intensity associated with per dollar of property damage to the tri-state region will be relatively low, which is typical of past hurricanes.

The impact of hurricanes on accelerated cement consumption appears to be determined by more than just the type of damage encountered. Whether the path of the hurricane included urbanized areas or was focused on more rural regions determines the size of the damage to property as well as the types of structures encountered by the hurricane. Typically, the more urbanized a hurricane-affected area, the greater the magnitude of damage and cement intensity per dollar of damage. The mix of structures encountered by Katrina in the tri-state region included a mix of urban and rural areas – again typical of past hurricanes.

The economic context at the time of the hurricane also appears to play a role in determining the level of accelerated consumption post-hurricane clean-up. Strong economic and construction activity at the time of a hurricane's landfall tends to amplify the period of accelerated consumption after the cleanup. Prior to Katrina, each state of the tri-state region was experiencing heavy construction and cement demand. Through July, the Florida market reported cement consumption growth from 2004 levels of 16.3%, Mississippi reported 18.6% growth, and Alabama recorded 4.3% growth.

Combining these factors, PCA estimates that Hurricane Katrina will cause acceleration in cement consumption above pre-hurricane trend levels by roughly 93,000 tons in the hurricane-affected areas during the post-cleanup period stretching from December through May 2006. This reflects a 13.8% acceleration in total consumption in the tri-state hurricane-affected region. On a state basis, the acceleration reflects a 2.6% increase in consumption activity during the recovery period.

Combining the period of depressed cement consumption expected during the clean-up period and the period of accelerated cement consumption during the rebuilding period leaves a rather small net increase in consumption of roughly 16,000 tons. This is typical of past hurricanes and reflects the low cement intensities associated with top-down wind damage.

Cement Demand Impacts: Louisiana

Point 1. The destructive nature of Katrina's impact on Louisiana is far different from the impacts arising in other hurricane affected areas.

Within Louisiana, 68% of the state's cement market was affected by Katrina. While wind and tidal surges contributed to the destructive nature of Katrina in many affected areas in Florida, Mississippi and Alabama, ***water damage*** resulting from two breeches of its

Louisiana

Parish	Cement Consumption *	Share of State Total
Parishes affected by water & high wind damage		
Jefferson	122.7	6.5%
Lafourche	32.1	1.7%
Orleans	145.1	7.7%
Plaquemines	26.0	1.4%
St. Bernard	14.6	0.8%
St. Charles	17.1	0.9%
St. John The Baptist	16.5	0.9%
St. Tammany	124.0	6.6%
Tangipahoa	29.4	1.6%
Louisiana Offshore	83.0	4.4%
Regional Total	**610.4**	**32.4%**
Parishes affected by high wind damage		
Ascension	43.6	2.3%
Assumption	7.5	0.4%
Livingston	33.7	1.8%
St Helena	5.1	0.3%
St James	3.7	0.2%
St Mary	24.8	1.3%
Terrebonne	46.8	2.5%
Washington	9.9	0.5%
Regional Total	**175.2**	**9.3%**
Parishes affected by other wind damage		
East Baton Rouge	162.0	8.6%
East Feliciana	6.9	0.4%
Iberia	19.9	1.1%
Iberville	15.0	0.8%
Lafayette	84.1	4.5%
Pointe Coupee	14.3	0.8%
St Martin	17.9	1.0%
Vermillion	19.1	1.0%
West Baton Rouge	23.5	1.2%
West Feliciana	6.6	0.4%
Regional Total	**369.5**	**19.6%**
Parishes unaffected		
Regional Total	**727.4**	**38.6%**

* Data based on 2004 estimate

Louisiana Composition of Cement Consumption

Region	Single Family	Highway & Streets	Resort	Industrial Commercial	Other
Louisiana	455.7	603.4	31.7	121.5	670.2
Parishes affected by water & high wind damage					
Jefferson	27.2	34.4	2.5	10.9	47.6
Lafourche	7.8	11.0	0.2	1.5	11.5
Orleans	15.5	74.4	4.6	9.6	41.1
Plaquemines	3.9	3.0	0.0	0.1	18.9
St. Bernard	2.4	4.5	0.0	1.2	6.5
St. Charles	7.0	2.0	0.0	0.3	7.8
St. John The Baptist	7.9	3.8	0.0	1.8	3.0
St. Tammany	64.9	18.2	2.5	19.7	18.6
Tangipahoa	15.3	4.2	0.0	2.2	7.8
Louisiana Offshore	---	---	---	---	83.0
Regional Total	**151.9**	**155.4**	**10.0**	**47.3**	**245.8**
Share of Total	**33.3%**	**25.8%**	**31.4%**	**38.9%**	**36.7%**
Parishes affected by high wind damage					
Ascension	28.7	4.3	0.0	2.1	8.5
Assumption	1.7	2.2	0.0	0.0	3.6
Livingston	22.6	4.3	0.0	1.1	5.7
St Helena	0.3	3.4	0.0	0.0	1.4
St James	1.4	0.7	0.0	0.0	1.7
St Mary	2.2	9.1	0.1	0.0	13.4
Terrebonne	11.8	6.5	1.0	6.7	20.8
Washington	3.4	3.6	0.0	0.2	2.8
Regional Total	**72.1**	**34.2**	**1.1**	**10.0**	**57.8**
Share of Total	**15.8%**	**5.7%**	**3.5%**	**8.3%**	**8.6%**
Parishes affected by other wind damage					
East Baton Rouge	38.8	46.6	8.0	29.2	39.4
East Feliciana	0.8	4.5	0.0	0.0	1.5
Iberia	5.2	7.6	0.4	1.0	5.7
Iberville	2.1	5.2	0.2	0.5	7.1
Lafayette	26.4	26.5	2.9	5.7	22.7
Pointe Coupee	3.1	7.5	0.0	0.0	3.8
St Martin	4.3	6.4	0.0	0.3	7.0
Vermillion	5.2	3.7	0.1	0.3	9.9
West Baton Rouge	2.2	15.9	0.0	0.3	5.1
West Feliciana	1.1	3.4	0.0	0.0	2.1
Regional Total	**89.2**	**127.2**	**11.6**	**37.2**	**104.3**
Share of Total	**19.6%**	**21.1%**	**36.5%**	**30.7%**	**15.6%**
Parishes unaffected	**142.4**	**286.6**	**9.1**	**26.9**	**262.4**

* Data based on 2004 estimate

levee system is responsible for most of the damage that will materialize in greater New Orleans. Water and high wind damage impacted 41% of the state's cement market.

In contrast to wind which damages property from the top down, water damages property from the ground up. Since usage of concrete in construction is more common at foundations and lower levels of building, it is likely that the cement intensity associated with per dollar of property damage to greater New Orleans will be extremely high in comparison to other hurricanes.

Compounding the issue of wind versus water damage, seldom has the full force of hurricanes destructive force had a direct hit on a major city. Katrina's strike on New Orleans alters not only the volume of buildings damaged but also the mix of structures affected. Compared to other hurricanes the mix will weigh more heavily on nonresidential structures which tend to have considerably higher cement intensities.

Point 2. Cement demand in New Orleans is expected to be depressed for a long period of time even under the most optimistic assumptions.

The average clean-up period for a Category 4 storm is roughly 4 months. This reflects conditions where flooding conditions are short lived. The persistence of standing flood waters in New Orleans will extend the required clean-up period. On September 1, FEMA estimated that it will take 36 to 80 days to drain the water from New Orleans. Clean-up, in preparation for accelerated construction activity, cannot commence until the water is cleared. This adds one to two months to the clean-up period. Furthermore, one to two additional months is probably required to clean up water damaged property compared to wind damages associated with previous hurricanes. Taking these factors into consideration, the clean-up period for New Orleans could run from six to nine months. For the purposes of this report, PCA assumes a seven-month clean-up period reflecting the average of the high and low estimates.

Point 3. PCA estimates that cement consumption in Louisiana will be severely reduced during the clean-up period.

Prior to Katrina the Hurricane-affected areas of Louisiana was running at a seasonally adjusted annual rate of 1.2 million metric tons annually (SAAR). Slightly more than half of this demand originated from areas now under water from the breach of the levees (610,000 SAAR). If these rates were sustained, depressed cement consumption associated with this area is expected to total 325,000 metric tons during 2005 and another 110,000 metric tons in the first quarter of 2006 – totaling 425,000 metric tons.

The remaining areas in Louisiana affected by the storm are expected to experience clean-up periods associated with typical hurricane conditions depending upon the type of damage incurred. These areas will reduce cement consumption by another 12,000 metric tons during 2005. All totaled, depressed consumption accounts for 16% of Louisiana's annual consumption and 65% of the state's consumption during the final four months of 2005.

Point 4. Softening in cement demand for the entire hurricane-affected region during the clean-up period is expected to partially offset the adverse impact of storm-induced supply disruptions in cement supply.

Combining the estimated reduced cement consumption associated with clean-up activities across all storm-affected areas totals 412,000 metric tons during 2005. The demand softening in the hurricane-affected areas should enable cement producers to divert some supply previously destined for these areas.

Tight market conditions prevail in many regions unaffected by the hurricane. PCA expects all the freed supply will be re-allocated to non-hurricane-affected areas and used to replenish inventories in anticipation of the cement requirements for rebuilding New Orleans. PCA assumes that 85% of the free supply will be re-allocated to non-hurricane affected areas (roughly 350,000 tons) – partially offsetting the impact of storm-induced supply disruptions. It is likely that most of this freed supply will find its way to the lower and middle Mississippi valley regions, where supply disruptions are expected to be greatest. The remaining 15% (roughly 60,000 tons) of the freed supply is expected to go toward rebuilding inventories.

Point 5. A high degree of uncertainty should be attached to estimates regarding post-clean up accelerated cement demand expected for Louisiana.

Given the magnitude of and type of damages (water/flooding) encountered by greater New Orleans, there is little doubt that a huge amount of cement will be required during the rebuilding stage of the city. Estimates of the accelerated cement consumption in the post-clean up period are dependent upon assumptions made regarding the extent of the damage and the nature of rebuilding that materializes in greater New Orleans. PCA assumes a complete restoration of the building stock within greater New Orleans. The potential for building code changes in the aftermath of Katrina could boost the required cement requirements. Code changes have not been incorporated into PCA estimates.

Information regarding the type and nature of damage to properties in flood areas is based on estimates provided by relief and insurance groups. PCA believes this data contains the potential for large error and revision.

Point 6. Rebuilding and repairing residential properties in greater New Orleans is expected to require a minimum of 2 million tons of cement.

The Red Cross estimates that Katrina destroyed 200,000 homes in Louisiana, with the highest concentration of destruction in greater New Orleans. The terminology "destroyed homes" used by the Red Cross implies that all of these homes must be rebuilt. PCA market research estimates that roughly 21 tons of cement is used per single family home in Louisiana. If Red Cross estimates are accurate, this implies 4.2 million tons of cement is required to rebuild residential structures. This serves as the basis for PCA's high cement consumption estimate. During 2004, Louisiana consumed 456,000 tons of cement for single family construction. The hurricane impact has the potential of increasing residential cement consumption by more than nine fold.

The housing stock for the state of Louisiana is estimated at 1.9 million homes. Red Cross estimates imply that more than 10% of all homes in the state of Louisiana were destroyed by the storm. In the greater New Orleans metropolitan area, housing stock is

estimated at 563,000 homes. Assuming these homes were destroyed by flooding, the Red Cross estimate implies roughly 36% of all homes in greater New Orleans.

PCA believes that initial Red Cross estimates may contain significant downside risk regarding the amount of cement required to restore New Orleans' housing stock. At question is to the proportion of damaged homes that must be torn down and rebuilt versus those which will require decontamination and repair.

In the past, Red Cross estimates of destroyed housing resulting from a hurricane was based on wind and tidal surge damage. This type of damage is easily visible and reliable estimates of "destroyed" homes could be undertaken. There is significant and widespread damage to New Orleans' housing stock from the city's flooding, unlike past hurricanes. What damage exists may not be visible. Many of the homes that the Red Cross has identified as "destroyed" may only require decontamination and repair – requiring significantly less cement to restore damaged housing. Assuming half of the homes identified by the Red Cross can be repaired, the additional cement required to restore New Orleans' damaged housing stock is reduced to 2.2 million tons. This serves as the basis for PCA's low estimate.

Point 7. Rebuilding and repairing infrastructure and nonresidential properties is expected to add a minimum of another 2 million tons to the amount of cement required in rebuilding New Orleans.

Other nonresidential construction and repair activity will add to the cement requirements in rebuilding New Orleans. Unfortunately, credible information regarding the magnitude of damage on these types of structures is lacking. Various damage estimates put property damage at $125 to $200 billion dollars. This forms the basis of the following PCA high-low estimates regarding incremental cement requirement in rebuilding New Orleans. According to insurance analysts, roughly half of this damage is attributed to flooding in New Orleans, or $63 to $100 billion.

The same analysts put infrastructure damage at $10 to $15 billion. Applying a general public infrastructure cement intensity to this damage estimate yields an increase in cement demand of 2.1 to 3.4 million tons.

Nonresidential building damage is estimated at $12 to $32 billion. Of this, a substantial portion may require repair rather than rebuilding. PCA has applied cement intensities to each damage estimate. According to these calculations, nonresidential rebuilding could add between 450,000 tons and 1.9 million tons.

Point 8. The rebuilding stage facing New Orleans will be stretched over a five year period.

The rebuilding of New Orleans will require design and planning. Public infrastructure projects and residential construction will probably lead the construction recovery. Nonresidential construction will lag as firms wait until signs of recovery of the regional

economy. In addition, labor and equipment constraints will force the rebuilding activity to be stretched over a period of years. PCA has assumed a five year rebuilding effort.

Point 9. Rebuilding and repairing greater New Orleans will add significant new demands for cement consumption.

The total incremental increase in cement consumption arising from the rebuilding of New Orleans could add between 4.7 and 9.3 million metric tons to demand. Based on an assumption of a five-year rebuilding program, the incremental increase in annual cement consumption will average 950,000 to 1.8 million metric tons per year.

Point 10. Katrina is likely to reduce national economic growth and construction activity – partially offsetting the increase in demand associated with hurricane rebuilding.

Past hurricanes have a relatively minor impact on national statistics, causing an average 0.1% to 0.2% depression in national real GDP during the quarter of landfall. This minor depression is recaptured in subsequent quarters by slightly stronger real GDP performance generated by the rebuilding period.

Katrina is likely to have a more profound impact on the economy than past hurricanes. By disrupting energy supplies and logistical movement of goods up and down the Mississippi, the adverse impact on the national economy could ignite inflationary pressures. These pressures could result in a significant erosion in consumer buying power, adversely impacting consumer spending, which accounts for 70% of the nation's total economic activity. Higher inflationary pressures could accelerate an upward movement in mortgage rates to the detriment of the housing and capital investment sectors. These adverse impacts could be compounded by reduced U.S. agricultural exports which rely upon the Mississippi River and the port of New Orleans as a venting point to foreign markets.

The length and magnitude of disruptions will determine the adverse impact to the national economy. Disruptions large in magnitude and length could reduce economic growth by 1% to 2% during the second half of 2005 and early 2006 – from an expected base of 3.5% real GDP growth. Such a scenario results from a run-up in inflation, an accelerated run-up in mortgage rates, a significant slow down in consumer spending, a slowing in job creation, and an exposure of consumer debt burdens.

Disruptions smaller in magnitude and relatively short could lead to a relatively minor adverse impact on the national economy. Given the magnitude of damages already revealed as well as the impact on energy prices and disruption of port activity, the adverse impact on the national economy is likely to reduce real GDP growth by no less than 0.3% to 0.5% during the second half of 2005. This growth loss would be recaptured in 2006.In any case it is likely that slower economic growth will adversely affect nonresidential and public construction activity. Assuming a 0.5% reduction in second half GDP growth, cement consumption would be expected to be reduced by 300,000 tons. Given the long lags between an economic disturbance and the impacts on nonresidential and public construction, the depressing affects from slower growth will probably not materialize until 2006.