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Annual Report on Michigan-Ontario Air Pollution 1982

International Joint Commission

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ON
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SUMMARY

Air quality in the Detroit-Windsor, Port Huron-Sarnia Reference area remains basically unimproved from that described in the Commission's previous Reports under the Reference. Particulate levels have remained relatively unimproved since 1976 following the substantial improvement in the three prior years. IJC objectives for suspended particulates have not been achieved in much of the boundary area. Sulphur dioxide levels have generally met IJC objectives throughout the area except in Lambton County. Ozone has improved but concentrations in the transboundary area still exceed the Ontario criterion at most locations and the less restrictive United States standard in some areas.

The Commission believes that attention should be directed at emerging rather than historical problems in the boundary region and at the adequacy of existing monitoring networks. To permit reporting on air quality problems in this region in a more meaningful way, the current Reference should be reviewed by Governments with a view to its updating.

I. Introduction

The Governments of the United States and Canada requested in a Reference dated July 8, 1975 (Appendix 1) that the International Joint Commission examine into and report at least annually on the state of air quality in the Detroit-Windsor and Port Huron-Sarnia areas, and on the measures taken to improve such air quality, with particular regard to the Michigan-Ontario Memorandum of Understanding on Transboundary Air Pollution.

The Memorandum of Understanding, signed in 1974, pledged the co-operation of the State of Michigan and the Province of Ontario in the implementation of air pollution control programs to achieve compliance with the air quality objectives recommended by the IJC in its 1972 Report on Transboundary Air Pollution: Detroit and St. Clair River Areas. These objectives were developed to protect the public health, safety, general welfare and property of the citizens in this region on both sides of the international boundary, and to serve as a minimum basis for the formulation of programs to reduce the emission of pollutants.

This Annual Report of the Commission, pursuant to the Reference, covers air quality data to the end of 1980. Because the Commission was not constituted with a quorum through most of 1981, it could not transmit a report to Governments on the 1979 activities and this report therefore covers activities for two years. The information contained herein is based on the Fifth and Sixth Annual Reports from the Commission's International Michigan-Ontario Air Pollution Board and on data collected and compiled by the Michigan-Ontario Transboundary Air Pollution (MOTAP) Committee. This Committee was established by Michigan and Ontario to assist in carrying out the terms of the Memorandum of Understanding.

II. Surveillance

The Michigan-Ontario Air Pollution Reference is a monitoring activity which is heavily dependent on having timely, accurate and meaningful data and interpretation. The nature of air quality assessment is such that the sampling of airborne constituents as well as the selection of data and modelling of effects must be based on sound principles, and appropriate distribution of sites for various parameters. Optimization of the monitoring network is especially important in an environment of reduced financial support for such surveillance activities.

The Commission is aware of declining support for air quality monitoring networks in the region because of constraints on manpower and equipment, as well as the more general trend of funding restrictions and a policy of rationalization of governmental and industrial activities due to current economic conditions. At issue here is the size and nature of the current air quality data network and how to achieve continued and indeed improved monitoring within the sets of technical and financial considerations noted.

The current transboundary air quality network consists of 190 stations, 110 in the United States and 80 in Canada. Most stations are distributed along the Michigan-Ontario border often paired across the border between Detroit/Windsor and Port Huron/Sarnia. Other stations located in counties adjacent to the transboundary region obtain important data on air pollution sources in the transboundary region and rates of movement of pollutants across the international boundary. Stations are operated by the local jurisdictions, the United States Environmental Protection Agency, Environment Canada, and regulated pollutant emitters as part of the conditions on the control of their emissions. Stations operated by the emitters are those which are most often the ones to be added or deleted from the network as conditions change.

The network was originally adequate to meet the 1975 needs for ambient air quality monitoring. Since then new needs have arisen, apparently resulting in an unco-ordinated growth of the network. For example, when the Commission requested information on ozone as a transboundary air pollution problem, "ozone" stations were added. When MOTAP and the Michigan-Ontario Board reported that carbon monoxide was found not to be a pollutant with transboundary potential, stations with carbon monoxide capability were dropped.

Within this context of change, resource limitations, and expanding knowledge on the importance of various substances (especially toxicants), how to measure them and how to model impacts, the time appears appropriate for a review of the air quality monitoring effort in the region. The goal of such review should be to determine an optimal design for air quality monitoring in the transboundary area, taking into account required compliance monitoring, emerging concerns and the potential contribution of air quality modelling. The outcome should be cognizant of funding limitations, and adaptive to changes in resources as well as knowledge and technology. The potential for integration and co-ordination of ambient air quality, air deposition, public health, biological and water quality monitoring, as parts of a broad spectrum of ecosystem monitoring, and for the co-ordinated efforts of several jurisdictions and the private sector, should all be kept in mind. The implications of such an effort, both technically and procedurally, may eventually extend well beyond the Reference area. Thus, the review would not only have intrinsic value with respect to the Reference and the Michigan-Ontario Memorandum of Understanding, but could serve as a test-study with applicability in other regions.

The Commission concludes therefore, that the adequacy of the monitoring network including its definition, procedures and related activities pertinent to the Reference area should be reviewed to insure that the amount and utility of air quality

data that can be obtained with the available resources can be maximized and additional needs identified and ranked. Such a monitoring network could also serve as a model for air and ecosystem quality monitoring networks in other boundary areas, both when specific problem areas have been identified and in conjunction with the broader air quality monitoring question.

III. Emission Trends

In specific response to the Reference, the Commission has reported emission levels only for total suspended particulates and sulphur dioxide (SO_2). A semi-quantitative assessment has also been provided for nitrogen dioxide, carbon monoxide and odours. The latter two are not currently problems in the area.

Particulate and sulphur dioxide emissions have decreased significantly in the Michigan-Ondario boundary area since 1971 (Appendix 2). Total sulphur dioxide emissions from major point sources decreased from 955,000 tonnes (1,052,000 tons) in 1971 to 337,000 tonnes (372,000 tons) in 1980. A similar decrease was observed for particulate emissions which decreased from 135,000 tonnes (149,000 tons) in 1971 to 38,000 tonnes (42,000 tons) in 1980. Decreases for both particulate and sulphur dioxide emissions occurred in all but one of the seven counties in the boundary area over this period. In Lambton County Ontario, particulate emissions increased from 6,000 tonnes (7,000 tons) in 1971 to 10,000 tonnes (12,000 tons) in 1980.

Substantial decreases for both particulate and SO_2 emissions occurred between 1972 and 1976, subsequently year to year changes have been small and not always consistent with the overall continuing downward trend. There were slight increases in total emissions in the boundary area of both particulate and sulphur dioxide emissions during 1978, but the generally downward

trend continued in 1979 and 1980. Variations from the trend are more evident when examined on a county-by-county or site-by-site basis.

Nitrogen dioxide emissions remained at levels that meet the Ontario criterion or the U.S. ambient air quality standard. However, since NO_2 is one of the pollutants that contribute to the formation of ozone and acidic precipitation, both mobile and stationary source emissions of NO_2 should remain of concern.

IV. Assessment of Air Quality Trends

The Board's Fifth and Sixth Annual Reports provide for the first time, some statistical analysis of air quality trends in the boundary area. This analysis generally confirms that significant improvements occurred in air quality with respect to suspended particulates and SO_2 during the early to mid-1970's, but did not continue in subsequent years. Recently only slight increases or decreases have occurred in the annual average concentrations and the number of excursions above objectives for particulates and SO_2. The causes for the slight changes in ambient levels are not known. They are without obvious pattern and may reflect changes in emissions (including fugitive dust levels), changes in power and industrial production, unusual meteorological conditions and/or the degree of variation that is inherent in any statistical sampling procedure.

Suspended particulate levels in both the Sarnia-Port Huron and Detroit-Windsor areas decreased markedly from 1972 to 1976. The period from 1976 to 1980 exhibits minor fluctuations but no statistically significant improvements. A small portion of the area is still in excess of the IJC 24-hour objective.

Air quality in most of the Detroit-Windsor segment of the Reference area remained in excess of IJC objectives for total suspended particulates in 1979, with slight increases in certain

areas from 1976 to 1979. In 1980 the air quality improvement trend was re-established with a 30% reduction in emissions. This reduction is believed to be attributable in large part to economic conditions causing lower production in the area, and therefore probably of a temporary nature.

The large decreases of particulate levels in the Sarnia-Port Huron area prior to 1976 have fallen to statistically insignificant changes. Conditions have, however, gradually improved to the extent that in 1980 this region included the largest area within the Reference area with 100% compliance.

Particulate emissions in the Macomb-Oakland area continue to slowly decline with a corresponding reduction in violation of IJC objectives.

Sulphur dioxide concentrations are generally at acceptable levels in the boundary area in terms of achieving the 1-hour and 24-hour IJC ambient air quality objectives. In Lambton County, however, levels increased from 1977 to 1978, remained unchanged in 1979 and increased again in 1980. Thus SO_2 objectives in Lambton County continued to be exceeded. There have been statistically significant improvements in sulphur dioxide levels in the Detroit-Windsor area since 1972. Exceedences of IJC objectives were minor in 1980 and not of transboundary significance. The IJC objectives for sulphur dioxide were not exceeded at sites in the Macomb-Oakland during 1980. Sulphur dioxide levels have shown statistically significant decreases in Sarnia-Port Huron from 1976 to 1980. As noted SO_2 levels exceeded objectives in Lambton County, mainly at sites in downtown Sarnia.

In 1980, all of the ozone analyzers in the transboundary area, recorded maximum 1-hour concentrations exceeding the Ontario criterion of 80 ppb, and with one exception exceeded the U.S. 1 hour standard of 120 ppb during the year.

Carbon monoxide is a pollutant that has been found not to be of transboundary significance, even though it may result in localized problems. The carbon monoxide standards or criteria were met on both sides of the border except at one Macomb County site and two Wayne County sites.

Nitrogen dioxide concentrations continue to remain within applicable jurisdictional standards or criteria throughout the transboundary area.

Ontario, Michigan and Wayne County air pollution control agencies are developing controls for toxic air contaminants and will continue to monitor these activities.

V. Adequacy of Enforcement

Part of the Reference to the Commission requests reports and recommendations on the adequacy of steps taken by Governments and by private interests to prevent, abate and control air pollution. Considerable progress has been made since 1972 in controlling specific major point source dischargers of suspended particulates and sulphur dioxide in the Reference area.

At the end of 1979, eight major point sources, all involving particulates, were not in full compliance with air pollution control requirements of the relevant jurisdiction. As of June 1982, four of the sources are in compliance, two of the sources have new compliance schedules mandated by the courts [Great Lakes Steel Company (Ecorse) and Great Lakes Steel Company (Zug Island)], one source has received a modified compliance date of 1985 [Ford Motor Company Coke and Steel Mill], and one source is currently in court [Detroit Sewage Treatment Plant Incinerator].

Compliance with jurisdictional requirements is not in itself a sufficient measure of progress under the Memorandum of Understanding. The adequacy of the governmental programs and resulting pollution control requirements with respect to achieving the IJC objectives must also be assessed.

With respect to suspended particulates, the Commission has noted in its last two Annual Reports under the Reference, that the IJC objectives and U.S. secondary standards were not expected to be achieved, even if all major point sources reach full compliance. A major reason is the fugitive particulate matter from sources such as construction sites, roads, storage piles and open fields. The Commission has previously reported the need for additional studies to quantify the fugitive emissions and to determine possible solutions, including improved "housekeeping" at such sites for the fugitive emissions problem.

The U.S. Clean Air Act requires that States implement a plan sufficient to attain and maintain applicable air quality standards whereever those standards are not currently being achieved. The State of Michigan forwarded a revised State Implementation Plan to the U.S. Environmental Protection Agency in May 1979. Additional studies were conducted in Wayne County for those areas exceeding the U.S. primary standard, in order to identify the sources, causes and appropriate control strategies. Effective January 1980, Michigan adopted revisions to existing emission limits to reflect the application of reasonably available control technology. Emission reductions are expected from sources such as spreader-stoker coal-fired boilers of industrial or utility size. New regulations have been adopted which require acceptable fugitive dust control programs. Wayne County Health Department is also in the process of adopting regulations concerning fugitive dust control.

For the area in five U.S. counties where there were exceedences of the U.S. secondary standards, the Board reported that studies do not show the exact cause of the problem, and therefore to recommend the most appropriate solutions. Studies are being carried out to determine what steps are needed to attain the U.S. secondary standards, which are essentially equivalent to the IJC objectives.

The Commission is not in a position, at present to assess the expected results of these implementation programs, and their probable impact on achieving IJC objectives. Improved emission inventory data for point and fugitive particulate sources, and further statistical analyses of emission levels and trends, will be required before the Commission can reach further conclusions on recent or future trends in air quality in the boundary area, and on the adequacy of control programs.

With respect to sulphur dioxide, the Commission noted in its previous Annual Report that control strategies appeared to be adequate for controlling local ambient levels, except in Lambton County, Ontario. It was noted in previous reports that a new strategy for controlling the multiple sources of sulphur dioxide in Lambton County has been under development for some time. After further delays in implementation, and at the urging of the International Michigan-Ontario Air Pollution Board, the necessary regulation was promulgated in early 1981. The effectiveness of this strategy can only be assessed conclusively from monitoring data to be collected in 1981 and subsequent years.

With respect to ozone and its precursors, the Commission notes that these pollutants originate mainly outside the boundary region. The most effective overall approach lies in the development and implementation of strategies within the context of national and binational long-range air pollution control programs. Since local peaking can occur downwind of urban sources of the precursor substances (notably hydrocarbons and the

oxides of nitrogen), measures to control local emissions in the boundary area are also desirable. The Commission was informed by the Board in October 1981 that reasonable control measures are available to reduce emissions of these substances and that the legislative authority exists for agencies in the boundary area to take action. Indeed, some steps have been taken towards the development and implementation of control strategies. The Board has requested that the MOTAP Committee provide further data suitable for determining trends, so that the Board and the Commission can be in a better position to assess the adequacy of control measures in future reports.

VI. Contingency Planning for Pollution Incidents

The MOTAP Committee is generally responsible for the development and maintenance of contingency plans to respond to accidental spills resulting in the release of toxic or hazardous substances to the air. In 1978, the Board requested MOTAP to expand its notification procedures now applicable to industries and rail companies to include pipelines, trucking and shipping companies. MOTAP has moved to carry out this recommendation.

The MOTAP Committee is also planning to include the nuclear power plant (Fermi #2) immediately south of the boundary area in Monroe County, Michigan, in its contingency plan. This will ensure that notification of any accidental radiation releases will be made to all affected parties on both sides of the international boundary.

VII. A Review of the 1975 Reference and Supporting Activities

The July 1975 Reference, unlike an earlier one of 1966, directs the Commission's attention to three specific pollutants: sulphur dioxide, suspended particulates, and odours, with emphasis on the quantity of emissions, ambient air quality, and remedial programs.

Emissions of sulphur dioxide have been reduced to a level consistent with achieving existing standards/criteria, and the IJC recommended objectives in most of the Reference area. Results of a new strategy implemented in Lambton County, Ontario in 1981 should indicate similar improvements. Further control of suspended particulates may be more difficult to achieve. Additional reductions in existing stationary sources will be incremental and costly. The Board has informed the Commission that it is unlikely that the IJC objectives will be reached by reductions in major stationary sources alone, and programs to control fugitive emission will also be necessary. Transboundary odour problems no longer seem to be a problem. More recently, the ozone levels have been monitored because of the recognized problems of photochemical oxidants and the record of excursions above critical levels in the boundary area.

Since the forwarding of the Reference to the Commission, the understanding of air pollution, its sources and impacts, has advanced considerably. Two new concerns which have become prominent in recent months are the long-range movement of air pollutants, and the widespread detection of various toxic and hazardous substances in the air.

The long-range transport of air pollutants has been explored elsewhere in Commission and governmental reports. No attempt has been made herein to assess the relationship between current local discharges of specific substances in the Reference area and the long-range problem. This problem is relevant, however, to the Reference area since the long range deposition in the region from distant sources, and the contribution of the industrial area under Reference of precursor substances such as sulphur dioxide, nitrogen oxides and hydrocarbons should be borne in mind.

A number of air-borne toxic and hazardous substances have been identified in the Great Lakes Basin as contributing to water pollution. Recent reports by the Commission under the Great Lakes Water Quality Agreement and other water pollution References have warned that several toxic inorganic elements and their compounds, and persistent and toxic organic substances (such as PCBs) are entering the Great Lakes in significant quantities via the atmospheric route.

Until recently, the possible presence of toxic substances in the air of the Reference area, and of transboundary flows, had not received attention under the Reference. The Commission believes that there is a need to direct more attention to monitoring a range of toxic and hazardous substances in the air, particularly in the vicinity of industrial complexes such as those in the Detroit-Windsor and Sarnia-Port Huron areas.

The Michigan-Ontario Air Pollution Board has been asked by the Commission to advise on the capability for advising on such pollutants, including the availability of data. The Board has noted the complexity of the issue as well as the lack of toxicity data and emission standards, despite the current priority attention of Governments to the issue, and has strongly supported increased monitoring. Should transboundary problems be identified, the Commission should be able then to provide advice and recommendations to the Governments of Canada and the United States, and through them to the state, provincial and local authorities, on the desirability of and possible measures to address this matter further.

A more specific application of this concern, directly related to the language of the present Reference, is the question of the physical and chemical characteristics of suspended particulate matter. The levels of suspended particulates in the Reference area generally exceed the IJC objectives and U.S. secondary standards, and for part of this area exceed even the

U.S. primary standard. The proportion of fine or respirable particulates being generated, controlled and released with current air pollution control measures, and the presence of corrosive or toxic agents as opposed to chemically inert particulates, are factors that the Commission believes are important to a better understanding of the significance of current suspended particulate levels as well as to addressing the issue of air-borne toxic substances.

To date, the information received by the Commission includes only the concentrations of total suspended particulates, emissions rates, and frequencies of exceeding standards or objectives, but no information on their chemical composition, size distributions or physical properties. The Commission has concluded that the additional information on the chemical and physical characteristics of suspended particulate emissions and depositions with particular emphasis on respirable particles in the reference area should be obtained and reported.

Furthermore, with respect to the Reference, the Commission has concluded (as discussed extensively in the Surveillance section of this Report), that a review of the air quality and deposition monitoring network, procedures and related activities is required. This might well form part of the revised concept of a Reference for this region or be authorized by the Governments in some other way.

THE COMMISSION RECOMMENDS, THEREFORE, THAT GOVERNMENTS CONSIDER AMENDING THE CURRENT REFERENCE TO THE COMMISSION TO ALLOW FOR A MODERN AND MORE RELEVANT AIR QUALITY ACTIVITY WHICH INCLUDES A CONSIDERATION OF THE PREVIOUSLY DESCRIBED EMERGING PROBLEMS, AS WELL AS A RE-EXAMINATION OF THE STRUCTURE OF THE CURRENT AIR QUALITY MONITORING NETWORK. THE COMMISSION WILL COMMUNICATE ITS DETAILED VIEWS ON THIS SUBJECT TO GOVERNMENTS IN THE NEAR FUTURE.

Finally, the Commission again draws the attention of the Governments to the fact that the Michigan-Ontario Memorandum of Understanding, now some seven and a half years old, had a target date for implementing control programs and other measures to achieve compliance with the air quality objectives recommended by the Commission, of December 31, 1978. In its third Annual Report the Commission noted that there may be merit in renewing the commitment of the Memorandum of Understanding with such revisions as may be agreed upon. This process of reconsideration might also take into account the substantial changes in knowledge and understanding concerning the cause and dynamics of air pollution, as well as its effects on various aspects of the ecosystem including man, that have occurred since the original signing in 1974.

Signed this 24th day of June 1982 as the International Joint Commission's Annual Report on Michigan-Ontario Air Pollution.

Robert C. McEwen

E. Richmond Olson, Q.C.

L. Keith Bulen

Charles M. Bédard

Donald L. Totten

Both the Government of Canada and the Government of the United States, with the full concurrence and support of the Governments of the Province of Ontario and the State of Michigan, believe that these efforts to reduce the problem of transboundary air pollution should be regularly reviewed to assure that meaningful improvement occurs and continues to occur.

Accordingly, the Commission is specifically requested, on a continuing basis, to examine into and report upon the state of air quality in the Detroit-Windsor and Port Huron-Sarnia areas, and, with particular regard to the Michigan-Ontario Memorandum of Understanding, on the measures undertaken to improve such air quality. Examinations shall be undertaken and reports to Governments submitted at any time the Commission may deem necessary, but no less frequently than annually. The Commission may make such reports public. The Commission may report and make recommendations on the following matters:

1. Ambient air quality trends for sulphur dioxide, total suspended particulates and odors.

2. Emissions of sulphur dioxide, total suspended particulates, and odors. The Commission may wish to report upon the effectiveness of enforcement activities directed at reducing the amount of pollution emitted by particular sources.

3. The extent and adequacy of surveillance of air quality, and the adequacy of steps taken by Governments and by private interests to prevent, abate and control air pollution. Particular reference should be made to the extent of compliance with ambient air quality objectives established by affected Federal, State and Provincial Governments, and to the enforcement activities undertaken by such Governments to reduce the incidence of pollution.

4. The steps taken by affected levels of Governments to prepare for, and to respond to, pollution incidents. The Commission should consider the adequacy of measures taken to respond to such incidents.

5. The adequacy of regular exchanges of air quality data and reports of progress of compliance with abatement schedules and special problems, and other matters which may arise from time to time in implementing the integrated plan outlined in the Michigan-Ontario Memorandum of Understanding.

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To permit the Commission to prepare its reports, the Commission may request from the Governments concerned, status reports providing complete information on their monitoring and surveillance activities, their compliance schedules and the implementation of such schedules, their enforcement actions, and their contingency plan activities.

A similar request is being transmitted to the International Joint Commission by the Government of the United States.

Allan J. MacEachen.

TABLE 1a

SULPHUR DIOXIDE EMISSION TRENDS FROM MAJOR SOURCES
Tonnes (Tons)/Year

Counties	1971	1977	1978	1979	1980
Wayne	337,793 (372,429)	115,613 (127,467)	107,712 (118,756)	88,925 (98,043)	78,122 (86,133)
Essex	25,187 (27,770)	1,377 (1,518)	1,351 (1,490)	1,134 (1,250)	697 (769)
SUB TOTAL	362,980 (400,199)	116,990 (128,985)	109,063 (120,246)	90,059 (99,293)	78,819 (86,902)
Lambton	284,402 (313,563)	163,709 (180,495)	185,413 (204,425)	183,863 (202,715)	203,776 (224,670)
St. Clair	292,546 (322,542)	92,086 (101,528)	80,439 (88,687)	61,994 (68,351)	46,547 (51,320)
SUB TOTAL	576,948 (636,105)	255,795 (282,023)	265,852 (293,112)	245,857 (271,066)	250,323 (275,990)
Kent	N/A (N/A)	943 (1,040)	943 (1,040)	0 (0)	299 (330)
Macomb	6,716 (7,405)	5,604 (6,179)	5,330 (5,877)	4,344 (4,789)	3,363 (3,708)
Oakland	7,969 (8,786)	5,903 (6,508)	5,630 (6,207)	5,042 (5,559)	4,158 (4,584)
SUB TOTAL	14,685 (16,191)	12,450 (13,727)	11,903 (13,124)	9,386 (10,348)	7,820 (8,622)
TOTAL	954,613 (1,052,495)	385,235 (424,735)	386,819 (426,482)	345,302 (380,707)	336,962 (371,514)

APPENDIX 2

TABLE 1b

PARTICULATE EMISSION TRENDS FROM MAJOR SOURCES
Tonnes (Tons)/Year

Counties	1971	1977	1978	1979	1980
Wayne	78,562 (86,617)	33,555 (36,996)	35,160 (38,765)	31,113 (34,303)	20,632 (22,747)
Essex	3,618 (3,989)	2,234 (2,463)	2,015 (2,222)	1,855 (2,045)	2,344 (2,584)
SUB TOTAL	82,180 (90,606)	35,789 (39,459)	37,175 (40,987)	32,968 (36,348)	22,975 (25,331)
Lambton	6,298 (6,944)	9,192 (10,135)	9,623 (10,610)	10,589 (11,675)	10,458 (11,530)
St. Clair	38,821 (42,802)	4,669 (5,148)	3,029 (3,340)	2,494 (2,750)	2,393 (2,638)
SUB TOTAL	45,119 (49,746)	13,861 (15,283)	12,652 (13,950)	13,083 (14,425)	12,850 (14,168)
Kent	N/A (N/A)	91 (100)	91 (100)	0 (0)	0 (0)
Macomb	3,548 (3,912)	1,415 (1,560)	1,487 (1,640)	1,249 (1,377)	1,092 (1,204)
Oakland	4,535 (5,000)	1,323 (1,459)	1,241 (1,368)	1,087 (1,198)	932 (1,028)
SUB TOTAL	8,083 (8,912)	2,829 (3,119)	2,819 (3,108)	2,336 (2,575)	2,024 (2,235)
TOTAL	135,382 (149,264)	52,479 (57,861)	52,646 (58,045)	48,387 (53,348)	37,850 (41,734)