

**EVALUATION OF THE BARRHAVEN
MULTI-UNIT HOUSING FOR
THE ENVIRONMENTALLY
HYPERSENSITIVE**

Prepared for:

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June 1997

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ABSTRACT

This report presents the results of a post-occupancy evaluation of the Barrhaven Multi-Unit Housing Project for the Environmentally Hypersensitive commissioned by Canada Mortgage and Housing Corporation. This is the first social housing project for environmentally hypersensitive individuals in Canada, and maybe the first in North America. Qualitative interviews were undertaken with tenants one year to eighteen months post-occupancy to ascertain satisfaction with the housing unit features and design, the neighbourhood, and the housing development. The results include a case description of each family or individual occupying the seven units. Dimensions documented include health-related concerns, functional capability, benefits experienced as a result of living in the dwelling, change in outlook in life, use of health and related social services, social interactions, and future plans. The report ends with recommendations for those planning similar social housing projects for individuals with environmental hypersensitivities.

ACKNOWLEDGEMENTS

Without the co-operation and participation of tenants of Barrhaven Multi-Unit Housing Project for the environmentally hypersensitive, this post-occupancy evaluation would not have been possible. We appreciate the thoughtful responses provided during interview and the graciousness with which we were invited into their homes.

We would like to thank Reverend Doug Powell, minister of the Barrhaven United Church, Richard Annett, president of the Barrhaven Non-Profit Housing Inc., and Janet Post, the housing manager for sharing background information with us and for facilitating the research process.

We also appreciate the insights provided by Phillip Sharp, the architect, and Jeff Armstrong, the builder, on the Project's design and building features.

Finally, we would like to acknowledge the guidance provided throughout the assignment by Virginia Salares of the Research Division of Canada Mortgage and Housing Corporation.

PROJECT TEAM

This assignment was undertaken by Darlene Flett, Christine Davis and Lynda Brooks of The Flett Consulting Group Inc.

FOREWORD

The Barrhaven Housing Project is unique, as it is the first social housing project in North America that was designed and built for the environmentally hypersensitive. The completion of this building was a significant milestone which was made possible by the receptiveness of Barrhaven United Church to sponsor this project, the financial support of the Ministry of Housing for Ontario and the exceptional efforts of the architectural/building/engineering team.

This post-occupancy survey of the project is not intended to document the design or construction of the building. The survey is not an evaluation of the design or construction. It does not do justice to the painstaking care taken in designing and constructing the building within the financial constraints imposed on the project. It documents, however, the perceptions of the tenants on how the building had met their needs, the acceptability of the indoor air, the desirability of the neighbourhood and the impact of living in this building on their health. To evaluate these results, it is important to bear in mind that the budget allocated for this project under the social housing program severely limited the design and selection of materials. As a consequence, this project has the element of an experiment - to try to construct a building with limited finances without sacrificing the quality of the indoor air.

The consensus is that this project is a qualified success. It is successful, since the tenants who moved into the building considered their units to be better than any other rental dwelling, and most of the original occupants have not moved. Two who have vacated their units moved for reasons unrelated to the acceptability of the units. The success has to be qualified since there are some aspects for which improvements can be made. These improvements are minor and can be implemented.

Demand for housing for sensitive people exists and this demand is expected to increase in coming years. Future endeavours to create specialized housing will benefit from experience learned from previous projects. It is with this aim that the report is presented.

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EXECUTIVE SUMMARY

This report presents the results of a post-occupancy evaluation of the Barrhaven Multi-Unit Housing Project for the Environmentally Hypersensitive commissioned by Canada Mortgage and Housing Corporation. This is the first social housing project for environmentally hypersensitive individuals in Canada, and maybe the first in North America. It is a seven-unit building located within a larger housing development owned and managed by the Barrhaven Non-Profit Housing Corporation Inc.

Qualitative interviews were undertaken with tenants one year to eighteen months post-occupancy, to ascertain satisfaction with the housing unit features and design, the neighbourhood, and the housing development. Topics explored during the interviews included reasons for selecting this housing option, the nature of their housing needs, their expectations, the extent to which their present housing met their needs, and the benefits or disadvantages of their current housing arrangement.

A specialist in environmental hypersensitivities made independent observations on how the tenant was impacted by the unit and the condition of the physical features of the unit. Interviews were also conducted by the researchers with the landlord and the project manager of the non-profit housing Board.

The results include a case description of each family or individual occupying the seven units. Dimensions documented include health related concerns, functional capability, benefits experienced as a result of living in the dwelling, change in outlook in life, use of health and related social services, social interactions, and future plans.

Most of the tenants perceived some health benefits since moving to the units and these benefits were felt to be the result of the special features incorporated into the units. With one exception, all tenants stated that the ventilation system was beneficial to their health. The tenants' ratings of other features in the unit were less positive in terms of effectiveness, aesthetic appeal and maintenance. Most of the tenants liked the neighbourhood because of its accessibility to needed convenience services, quietness and other amenities. They also saw benefits from the segregated setting of the housing project. For the most part, tenants were not heavy users of health and social services.

The report ends with recommendations for those planning similar social housing projects for individuals with environmental hypersensitivities.

SOMMAIRE

Ce rapport présente les résultats de l'évaluation après occupation d'un ensemble de logements collectifs aménagé à Barrhaven à l'intention des personnes hypersensibles aux polluants environnementaux. Ce projet avait été commandé par la Société canadienne d'hypothèques et de logement. Sept des logements sont conçus spécialement pour les personnes hypersensibles aux polluants environnementaux, faisant de cet ensemble résidentiel l'un des premiers du genre à être aménagé au Canada et peut-être même en Amérique du Nord. L'ensemble résidentiel appartient à la Barrhaven Non-Profit Housing Corporation Inc. qui en assume aussi la gestion.

Des entrevues qualitatives ont eu lieu avec les locataires occupant leur logement depuis un an jusqu'à dix-huit mois; on voulait ainsi connaître leur degré de satisfaction au sujet des caractéristiques et de la conception de leur logement, et à l'égard du voisinage et de l'ensemble résidentiel. Les entrevues ont notamment porté sur les raisons motivant leur choix de logement, la nature de leurs besoins de logement, leurs attentes, la mesure dans laquelle leur logement actuel comble leurs besoins, et les avantages ou inconvénients de leur situation de logement actuelle.

Un spécialiste de l'hypersensibilité aux polluants environnementaux a fait des observations indépendantes sur l'état de chaque logement et son incidence sur les locataires. Des chercheurs ont également effectué des entrevues avec le propriétaire et le directeur de projet de l'organisme sans but lucratif.

Les résultats présentent une description de cas portant sur chaque famille ou personne occupant les sept logements. Les questions ont porté sur les raisons de santé, la capacité fonctionnelle, l'incidence sur l'état de santé et la perspective émotionnelle, le recours aux services de soins de santé et services sociaux connexes, les interactions sociales, et les plans pour l'avenir.

Pour la plupart, les locataires ont indiqué que leur état de santé s'était amélioré depuis qu'ils occupaient leur logement et que cette amélioration était attribuable aux caractéristiques spéciales qui avaient été intégrées à leur logement. Tous les locataires sauf un ont indiqué que le système de ventilation était favorable à leur état de santé. Par ailleurs, le degré de satisfaction à l'égard des autres caractéristiques des logements était plus faible concernant l'agencement en général, l'esthétique et l'entretien du logement. La plupart des locataires étaient satisfaits de l'emplacement et du voisinage, à cause de l'accessibilité des services, de la tranquillité du secteur et d'autres aménagements communautaires. Ils ont également dit qu'ils considéraient comme un avantage le fait que les logements soient aménagés dans un bâtiment distinct. Pour la plupart, les locataires n'utilisaient pas tellement les services de soins de santé et les services sociaux.

À la fin du rapport se trouvent des recommandations pour ceux qui prévoient aménager des ensembles similaires de logement social pour les personnes hypersensibles aux polluants environnementaux.



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1 INTRODUCTION

This study on the tenants' perceptions of the Barrhaven Multi-Unit Housing Project was conducted during the summer and fall of 1994. Some physical aspects of the housing project are referred to in this study. It does not attempt, however, to document the design or construction.

1.1 Brief Overview of the Barrhaven Multi-Unit Housing Project for the Environmentally Hypersensitive

The Barrhaven Multi-Unit Housing Project (henceforth referred to as the Barrhaven Project) for persons with environmental hypersensitivities is a seven unit non-profit housing project. It is part of a larger 41 unit development sponsored by the Barrhaven United Church and built with financial assistance from the Ministry of Housing for Ontario under their non-profit housing program. This development targets low and modest income families who cannot afford more expensive housing alternatives. Rents in the project range from \$550 a month for a one bedroom unit to \$700 for a three bedroom unit.

Eighteen of the forty-one units in the development are stacked townhouses in three buildings, and sixteen units are in a two-storey apartment building, all of conventional construction. The seven unit two storey building that was designed and constructed specially for people who are environmentally hypersensitive is situated in one corner of the development, bounded by private single homes in the east, a railway track on the south side, and a baseball field in the west. This unique housing project is the first of its kind in Canada, and may be the first in North America.

The Barrhaven United Church Non-Profit Housing Board became involved with the Project through one of its members who suffers from environmental hypersensitivity. Since twenty-one units were allocated for tenants with disabilities, it was proposed that seven of these be built to accommodate persons with environmental hypersensitivities. The architect for the larger 41 unit housing development specialized in housing design for the disabled, and he expressed an interest in researching and designing a project

for persons with environmental hypersensitivities. The design and planning for this project was started in 1990.

In 1991, the design had reached an advanced stage and was one of over 70 submissions to the Healthy Housing Design Competition sponsored by the Research Division of Canada Mortgage and Housing Corporation. The team for the Barrhaven Project included Phillip Sharp, architect, the building team of Oliver Drerup and Jeff Armstrong and Don Buchan of the engineering firm, Buchan, Lawton and Parent. The design for the Barrhaven Project was selected as one of the ten finalists in the first stage of the competition.

Construction of the building was started in July, 1992. Before and during the construction, the building team consulted with Virginia Salares, the project manager of the initiatives on housing for the environmentally hypersensitive at CMHC. A testing panel composed of eight environmentally hypersensitive individuals in the Ottawa area assisted in selecting building materials and finishes. The building was completed in March 1993 and was ready for occupancy in April 1993.

The design for the Barrhaven Project was selected as one of the winners in the American Institute of Architects and the International Union of Architects "Call for Sustainable Community Solutions" design competition in June, 1993. The competition attracted more than 400 submissions in 25 categories from over 50 countries.

The present tenants are the building's first occupants. They moved into the project shortly after it was completed in the Spring of 1993. They include three families with children, a young couple, and three women living alone - an older widow and two single middle aged women. Three families have their rent fully subsidized, two families are partially subsidized, and two families pay full market rent.

The seven families occupying the units were selected from a waiting list of applicants on the basis of several criteria. First, it was required that each applicant submit a letter from their physician attesting to their environmental sensitivities. In addition to the physician's letter, each applicant was interviewed by a board member (if possible in the applicant's own home). A specialist in environmental hypersensitivities was present at each interview to assist in identifying the severity of their disability and other factors that could affect success of tenancy. The aim was to select individuals suffering from allergies (of medium to intense severity) brought on by exposure to chemical off-gassing, dust and/or molds (as opposed to food allergies) which could possibly be addressed by the special nature of the housing project in combination with related changes in lifestyle.

1.2 Some Special Features of the Barrhaven Multi-Unit Housing Project



Figure 1: The Barrhaven Multi-Unit Housing Project viewed from the west side. On foreground is the park.

The Barrhaven Multi-Unit building and design to accommodate seven units were in part determined by the shape and size of the lot and amount of funding allowed to build this number of units. Funding for this project fell under the MUP (Maximum Unit Price) guidelines of the Ontario Ministry of Housing. These guidelines allow for 12% above the cost for an equivalent standard unit. The incremental cost covers the additional expense to accommodate the disability, which in this case, is environmental hypersensitivity.

A description of the project and special provisions for the environmentally hypersensitive occupants is included in the appendix. Some notable features that were relevant to the evaluation are the following:

Absence of a basement

Basements are typical in conventional housing. These are very frequently a source of musty odours and molds. The design purposely eliminated a potential mold problem.

Carefully selected materials

Carpets, a known source of chemical pollutants and molds, are not found in the building. The floors on both levels are polished concrete (without chemical additives). Instead of painted gypsum board walls and ceilings, interior surfaces are unpainted concrete and solid wood. Most exterior walls and walls that separate the units are specially-made concrete blocks. The remaining walls, second floor ceiling and partition walls within each unit are tongue-and-groove basswood. These surfaces were finished with clear, odourless sealants. The only surface that was painted, with a low odour paint, is the ceiling on the first floor (the underside of the concrete slab of the second floor).

No particle board, plywood or pressed woods were used anywhere. Countertops and open shelves in the kitchen were made of maple. Suggested maintenance of the butcher block consists of periodic rubbing with vegetable oil. Staircases, cabinets, shelves and doors are made of solid wood.

Heating and ventilation

No gas or oil is used in the building. Domestic hot water is supplied by an electric hot water tank. Space heating is supplied by an electric boiler. Heat distribution is by means of a fan-coil (forced air blowing through a hot water coil). The units are continuously ventilated, i.e., fresh air is brought in and an equivalent amount of air is exhausted through a heat recovery ventilator (HRV). Continuous ventilation supplies fresh air, removes odours and prevents moisture from building up. The air distribution ducts are visibly surface-mounted on the walls to make them accessible for cleaning.

Each unit has its own HRV. Outside air (warmed as needed) is delivered to the bedrooms and living rooms, while stale air is exhausted from areas where pollutants are typically produced (the bathroom, kitchen, foyer, cabinets and mechanical room). A credenza, made of glass and wood frame, which can be used for a television, computer or storage purposes, is also exhausted. The refrigerator is in a vented closet, with a door at the back which can be accessed for cleaning.

Lighting

Windows are double-glazed, with clear glass in aluminum frames. Non-low-E glass was specifically chosen (see footnote on page 29). The bathrooms of all the units and the kitchen of four units are situated in interior areas and are not provided with windows.

Given that the Barrhaven Project is a special housing development, building to meet the needs of the hypersensitive within the allowed funding was a challenge to the building team. Materials with a more conventional appearance which have the least negative impact on the quality of the indoor air, but which were too costly, could not be used. The building team used techniques and materials which had low emission (off-gassing) potential and were still affordable. However, limited funds at the finishing stage did not permit installation of adequate carpentry and application of finishes beyond one coat. This included the decision to limit kitchen fittings to open shelves and work tops, designed to allow future installation of hardwood doors by either the tenants or owners, if desired.

1.3 Study Purpose and Approach

The purpose of this study was to obtain the perceptions of the tenants and the landlord of the Barrhaven Project. In particular, CMHC was interested in knowing if the building fulfilled the use for which it was designed.

A series of qualitative interviews were conducted to collect the information. At the outset of the study, consultations were held with CMHC, the architect and the builder in order to obtain background information about the project that would assist in questionnaire development. An initial site visit to the Project was made and interviews were conducted with the landlord and the project manager of the non-profit housing board to obtain their opinions. During this time, two tenants were briefly interviewed and a tour of the units was conducted. These early interviews assisted with the development of the longer questionnaire.

Each of the tenants completed a two to four-hour face-to-face interview (in two cases the interview was conducted over more than one session to accommodate the respondent's fatigue level) with the consultant. A specialist in environmental hypersensitivities accompanied the consultant on each interview. The specialist made independent observations on how the tenant was impacted by the unit and the condition of the physical features of the unit.

2 BACKGROUND DESCRIPTION OF TENANTS

This section describes the tenants living in the Barrhaven Project in terms of their socio-demographic background (income, education, family composition, employment status), previous place of residence, functional capability, use of health related services, social supports, health related concerns prior to occupancy, how they heard about the Barrhaven Project, and the main factors that motivated them to move to Barrhaven. These descriptive factors set the context for the evaluation.

Individual case descriptions on a family by family basis are given in Exhibit 1.

2.1 Socio-Demographic Characteristics

Income and Education

The majority (four out of seven) of the families living in the Barrhaven Project report a household income (before taxes) of less than \$15,000. One family has a household income of between \$30,000 and \$35,000, and two families report household incomes of \$40,000 or more.

All of the adult tenants in the Barrhaven Project have completed high school and have at least some post secondary education. Five tenants have completed a university degree. Of these tenants, one tenant has a post graduate degree. Another tenant is a nurse.

EXHIBIT 1	FAMILY A	CASE DESCRIPTION
Number of Occupants	Four	
Family Composition	Husband, wife and two children (girls aged 4 and 12).	
School and employment status	Husband works full-time and wife now works 30 hours per week. Children are in school.	
How family heard about apartment	Wife's mother heard about the apartment through The Allergy and Environmental Health Association.	
Why family moved to apartment	Were living in a chemical stew, chemicals were being used daily to kill cockroaches, etc.	
Health related concerns	Husband reacts to paint and chemicals. Wife reacts to chemicals, foods, inhalants, mold, dust, and cat hair. The wife, the household member most affected by environmental sensitivities and the person interviewed, was experiencing fatigue, was lethargic, very sick and could not work prior to moving to the Project.	
Functional capability	Still hampered a great deal in taking the bus, in taking part in outdoor social activities, and in going to the dentist. Somewhat hampered for all other applicable categories. Since moving, things have stayed the same in all respects, except for going to work and doing housework (which have improved).	
Benefits experienced as a result of living in apartment	After six months, the odour of new wood in the unit disappeared and she was feeling better. After one year, a lot better, more energetic, concentration has improved and is able to work 30 hours per week. Children are happy with the yard, which they did not have in their previous housing arrangements.	
Change in outlook on life since living in apartment	General outlook on life has changed somewhat since moving; she feels that it is a positive change.	
Sources of information about condition and how to cope	Does not belong to any associations or support groups for economic reasons. Gets information from magazines, books and word of mouth (neighbours and family).	
Use of health and related services	During the last six months there have been visits to medical specialists and to a community health centre.	
Major change to therapies or medications since moving to apartment	Taking more herbal remedies now and eating better food.	
Extent of social interaction in the last week	Spoke on the telephone and visited with people a few times during the past week.	
Housing plans and expectations for the next year	See themselves living in this apartment forever.	
Longer term housing plans, requirements and preferences	Same as above.	

EXHIBIT 1	FAMILY B	CASE DESCRIPTION
Number of Occupants	One	
Family Composition	Lives alone.	
School and employment status	Does not work.	
How family heard about apartment	T.V. - Market Place. She then telephoned the Pastor of Barrhaven United Church and had a short interview with him.	
Why family moved to apartment	Was looking for alternative housing arrangements, there is more medical knowledge about environmental sensitivity in Ottawa and The Allergy and Environmental Health Association has an active branch in Ottawa.	
Health related concerns	Puffy eyes, trouble breathing, bothered by fumes, perfumes, deodorizers and chlorine.	
Functional capability	Hampered a great deal in going to the grocery store, doing housework, in taking the bus, and in going to the library. Somewhat hampered for all other applicable categories. Since moving here, her ability to go to a grocery store has worsened, her ability to take part in outdoor activities has stayed the same, and her ability to walk around the neighbourhood has improved.	
Benefits experienced as a result of living in apartment	After three months, she had more vitality, eyes were better, and she could withstand more in terms of breathing.	
Change in outlook on life since living in apartment	General outlook on life has changed somewhat since moving. She feels this is a negative change because more time is passing by and she is not doing the things she would like to be doing.	
Sources of information about condition and how to cope	Belongs to The Allergy and Environmental Health Association and is thinking about joining other associations or support groups. For information, she looks to books, her doctor, and to The Allergy and Environmental Health Association's publications (gets the most information here).	
Use of health and related services	During the last six months she has visited an environmental medicine specialist.	
Major change to therapies or medications since moving to apartment	Changed her supplements - added new ones, and using less of some of the ones she used previously.	
Extent of social interaction in the last week	Spoke on the telephone once and did not visit with anyone during the past week.	
Housing plans and expectations for the next year	Hopes to move out as soon as possible, preferably within the next five months.	
Longer term housing plans, requirements and preferences	Wants to be in Ottawa for two to three years and then move to B.C. to a warm climate.	

EXHIBIT 1	FAMILY C	CASE DESCRIPTION
Number of Occupants	Two	
Family Composition	Husband and wife.	
School and employment status	Husband does computer work. Wife is exploring the continuance of her university education at the graduate level. She had to discontinue courses at Carleton University because of poor air quality in the classrooms.	
How family heard about apartment	From the wife's parents who attend the Barrhaven United Church and were instrumental in initiating the development of the Project.	
Why family moved to apartment	They could not buy a house and this was the only rental with an acceptable living environment.	
Health related concerns	Wife has problems with wood stove smoke and mold.	
Functional capability	Wife is hampered a great deal in going to school and in going on a vacation. She is somewhat hampered in walking around inside of a shopping mall, eating in restaurants, and in visiting friends. Since moving, things have stayed the same for her. She basically moved from one healthy environment to another.	
Benefits experienced as a result of living in apartment	It is hard for her to assess benefits. She has maintained the same level of healthiness here as she had before moving out of her parents' house.	
Change in outlook on life since living in apartment	General outlook on life has not changed at all since moving.	
Sources of information about condition and how to cope	She does not belong to any associations or support groups. She gets all of her information from her mother who does belong.	
Use of health and related services	During the last six months she has visited a naturopath, a homeopath, and a medical specialist.	
Major change to therapies or medications since moving to apartment	No changes to therapies or medications since moving to apartment.	
Extent of social interaction in the last week	Spoke on the telephone and visited with people a few times during the past week.	
Housing plans and expectations for the next year	Would like to live here for the next year.	
Longer term housing plans, requirements and preferences	They expect to build a house of there own. They will be careful in choosing materials and would like the house to have a good ventilation system.	

EXHIBIT 1	FAMILY D	CASE DESCRIPTION
Number of Occupants	Four	
Family Composition	Husband, wife and two children (both girls).	
School and employment status	Husband works full-time. Children go to school.	
How family heard about apartment	Through word of mouth.	
Why family moved to apartment	Wife and youngest daughter have environmental sensitivities.	
Health related concerns	Youngest daughter has very bad asthma (in hospital for three months), is allergic to household dust, mold, wood stove smoke, and is sensitive to chemicals.	
Functional capability	Daughter has trouble on the school bus because the driver smokes. She can now go to stores and malls, this was not possible before moving to the Project.	
Benefits experienced as a result of living in apartment	After three months, daughter was almost medication free. Within six months, she started to plateau but there has been no deterioration. In fact, she has not visited the emergency room once in the past year compared to an average of weekly visits in the previous year.	
Change in outlook on life since living in apartment	The outlook of the daughter affected by environmental sensitivities has improved tremendously.	
Sources of information about condition and how to cope	Do not belong to any associations or support groups. Get information from their doctor, Ec - Sense (The Allergy and Environmental Health Association of Canada newsletter) and from the newsletter of the Asthma Association.	
Use of health and related services	During the last six months there have been visits to the family doctor and to a counsellor.	
Major change to therapies or medications since moving to apartment	Eating healthier, improvement in prevention (do not go into households where there are dogs or cats), use less medications and eliminated visits to the emergency department.	
Extent of social interaction in the last week	They see old friends and the girls have friends at school.	
Housing plans and expectations for the next year	Do not know.	
Longer term housing plans, requirements and preferences	Would like to live in a similar environment, but would like to own their home so that they could control who they are around with and where they are living.	

EXHIBIT 1	FAMILY E	CASE DESCRIPTION
Number of Occupants	One	
Family Composition	Lives alone.	
School and employment status	Presently not working. Occasionally does part-time work.	
How family heard about apartment	Market Place, 1990. The architect, Phillip Sharp, was on the program and she got in touch with him.	
Why family moved to apartment	Ecologically safe place to live.	
Health related concerns	Exhaustion, overwhelming fatigue, reacts to chemicals, mold, perfumes, and experiences shortness of breath.	
Functional capability	Hampered a great deal in taking part in indoor recreational activities. Somewhat hampered in walking around the neighbourhood, walking around inside a shopping mall, and in taking part in outdoor recreational activities. Since moving doing housework and taking part in outdoor recreational activities has improved. Taking part in indoor recreational activities, walking around the neighbourhood and going to work has worsened.	
Benefits experienced as a result of living in apartment	After three months, her energy improved and she could push herself to do things. After a year she had a setback because of an odour problem in the unit. (Note: the drain trap in the unit had dried up causing odours. This has been corrected.) Overall, she feels that she has not improved. Wood burning, perfume, and certain foods still affect her.	
Change in outlook on life since living in apartment	General outlook on life has not changed at all since moving. She feels that her housing has improved but she misses home and is having trouble finding a job, therefore her outlook is somewhat negative.	
Sources of information about condition and how to cope	She does not belong to any associations but goes to meetings at the University of Ottawa. She gets her information from her doctor, health food stores, and from neighbours and goes to ecological information meetings.	
Use of health and related services	During the last six months she has visited her family doctor, a naturopath, an environmental medicine specialist and a dermatologist.	
Major change to therapies or medications since moving to apartment	Now has occasional massages, fasts, and goes to the Holy Family Centre (for self-healing).	
Extent of social interaction in the last week	Spoke on the telephone a few times and visited with people maybe once during the past week.	
Housing plans and expectations for the next year	Would like to remain in her current housing unit but afraid she will be unable to afford it and fears that she will become a bag lady.	
Longer term housing plans, requirements and preferences	Would like to remain in current unit.	

EXHIBIT 1	FAMILY F	CASE DESCRIPTION
Number of Occupants	One	
Family Composition	Lives alone.	
School and employment status	Retired. Is writing a book on her experiences as a person with environmental sensitivities.	
How family heard about apartment	Member of Provincial Parliament and then phoned the pastor of Barrhaven United Church.	
Why family moved to apartment	Thought she would be able to breath better and feel safer health wise. Also, she was looking for housing with better ventilation .	
Health related concerns	Confused, trouble sleeping, trouble breathing, allergic to car exhaust, allergic to many chemicals (detergents and barbecues), and experiences eye swelling.	
Functional capability	Hampered a great deal in walking around the neighbourhood. Somewhat hampered in doing housework and going to the grocery store. Since moving, her ability to walk around the neighbourhood and to drive a car have improved.	
Benefits experienced as a result of living in apartment	Has gradually improved over the past year. Breathing has improved and her "brain fog" has diminished. She also sleeps more now. However, her eye swelling is worse.	
Change in outlook on life since living in apartment	General outlook on life has changed somewhat. She is encouraged because her physical health has improved, but she is discouraged because she is lonely (misses friends and family who are out-of-town).	
Sources of information about condition and how to cope	Does not belong to any associations or support groups. She is not looking for information now, she learned everything ten years ago.	
Use of health and related services	During the last six months she has visited her family doctor, seen a gastro-enterologist, and has gone to emergency.	
Major change to therapies or medications since moving to apartment	Now takes blood pressure pills.	
Extent of social interaction in the last week	Spoke on the telephone a few times and has visits with immediate neighbours almost everyday. Also babysits a neighbour's daughter.	
Housing plans and expectations for the next year	Would like to live here for the next six months.	
Longer term housing plans, requirements and preferences	Would like a place that is more spacious, has plaster walls, more storage, has a balcony and does not have a forced air heating system.	

EXHIBIT 1	FAMILY G	CASE DESCRIPTION
Number of Occupants	Two	
Family Composition	Mother and one child (girl age 9).	
School and employment status	Mother does not work. Child does not go to school because of hypersensitivities. Mother has taken on responsibility for education of her daughter at home.	
How family heard about apartment	Ottawa-Carleton Regional Health Authority.	
Why family moved to apartment	Units are supposed to be ecologically safer, there would be more children for her daughter to play with, and the units are geared to income.	
Health related concerns	Daughter suffers from bone pain, she is hyperactive, is allergic to certain odours (e.g. perfume), has asthma, eczema, and food allergies. Mother has asthma and is allergic to many odours and fumes.	
Functional capability	Mother hampered a great deal in doing housework and in eating in restaurants. Not at all hampered in visiting friends and relatives as they are sensitive to her requirements. Since moving, it has become more difficult to do housework and to eat in restaurants. It has become easier to take part in outdoor recreational activities because of their availability.	
Benefits experienced as a result of living in apartment	After six months, daughter was feeling better. Her long bone pain had diminished, her hyperactivity had decreased, and her asthma was better. Her outlook has also improved because she is around other children with allergies. However, her eczema and food allergies have become worse. The mother's condition has not improved significantly.	
Change in outlook on life since living in apartment	General outlook on life has changed somewhat since moving. It has been a positive move for the daughter and a negative one for the mother.	
Sources of information about condition and how to cope	Cannot afford a membership to The Allergy and Environmental Health Association but they are on the mailing list. They receive information from mailings, from their doctor, and from lectures they attend.	
Use of health and related services	During the last six months there have been visits to the family doctor, to an environmental medicine specialist, to a back specialist, and to Supplementary Aid (Ottawa-Carleton Social Services Department).	
Major change to therapies or medications since moving to apartment	No changes to therapies or medications since moving to apartment.	
Extent of social interaction in the last week	Spoke on the telephone and visited with people almost everyday during the past week.	
Housing plans and expectations for the next year	See themselves living in this apartment until their economic situation improves.	
Longer term housing plans, requirements and preferences	Same as above.	

Family Composition

Three of the seven units in the Barrhaven Project are occupied by tenants who live alone. Three units are occupied by families with one or two children including a lone parent mother. The seventh unit is occupied by a couple with no children. All of the children except one are of school age.

Employment Status

In terms of employment status, three families in the Barrhaven Project have at least one adult working full time (one has environmental hypersensitivities and two do not). Two other tenants with environmental hypersensitivities work outside the home on a part time basis. One tenant is unemployable because of her disability. Another tenant was formerly employed but has assumed full responsibility for her daughter's education. The daughter as well as the mother have environmental hypersensitivities. One tenant is retired.

2.2 Previous Place of Residence

The uniqueness of the Barrhaven Project is demonstrated by the distance that tenants were willing to travel to occupy the units. Two families originally from Fredericton, New Brunswick and St. John's, Newfoundland had moved to Ottawa. One tenant came from Perth, Ontario. The remaining four families lived in other neighbourhoods in Ottawa-Carleton prior to moving to the Project.

Most of the tenants (five out of seven families) rented their previous residence. Two tenants (a couple) had lived at home with their parents prior to moving to the Barrhaven Project. The size of the tenants' previous homes varied. However, almost all reported living in a larger home before moving into the Barrhaven Project.

When asked how they heard about the Barrhaven Project, the tenants interviewed gave a variety of responses. The sources included:

- television (Market Place);
- an allergy association;
- through the church (parents attended);
- relatives and friends;
- Member of Parliament; and
- Ottawa-Carleton Housing.

When asked about their main reasons for moving to the Barrhaven Project, tenants reported health and housing related factors. They were aware that the units were built for the environmentally sensitive. Families with children were motivated by the belief that their children's health was being threatened in their previous place of residence. For example, one interviewee recounted the fact that her daughter spent three months in a hospital because of her severe allergies. Another tenant was of the opinion that she would have improved access to resources and services (such as allergy related information) if she moved to the Barrhaven Project.

2.3 Perceived Health Prior to Occupancy

Tenants were asked to describe how they felt in terms of their overall health, just prior to moving to the Barrhaven Project. Several tenants reported that they experienced severe exhaustion much of the time. Fatigue prevented some tenants from taking part in "normal" activities (i.e., walking anywhere, driving a car, going to work). In addition to exhaustion, one tenant disclosed feeling confused much of the time and having difficulty thinking and reasoning. Another tenant described the symptoms her child was experiencing prior to occupancy. These included eczema, hyperactivity and asthma.

2.4 Functional Capability

Exhibit 2 lists some everyday activities and the number of tenants who report having difficulty with one or more of these activities. The Exhibit also gives the number of tenants who report that things have improved for them since moving to the Barrhaven Project. It should be noted that several tenants never participated in some of these activities (regardless of their limitations).

The Exhibit shows that tenants are experiencing at least some difficulty with most activities. The majority of tenants (who normally undertake these activities) report being hampered by their condition in terms of walking around the neighbourhood, walking around the inside of a shopping mall, eating in restaurants, going to a grocery store, and taking part in outdoor recreational activities.

Things have improved for a few tenants with respect to their functional capability since moving to the Barrhaven Project. Exhibit 2 shows that one or two tenants (depending on the activity) report functional improvements in activities such as walking around the neighbourhood, going to work, doing housework, driving a car, taking part in outdoor recreational activities and eating in restaurants.

EXHIBIT 2
TENANTS' FUNCTIONAL CAPABILITY

Number of tenants who were hampered before moving to the project	A GREAT DEAL	SOMEWHAT	NOT AT ALL	NOT APPLICABLE**	Number of tenants who say things have improved since living at Barrhaven ***
Walking around the neighbourhood	1	4	2	0	2
Going to a grocery store	1	2	2	2	0*
Walking around inside a shopping mall	0	4	0	3	0*
Going to work	0	2	0	5	2
Doing housework	2	1	2	2	2
Going to school	1	0	0	6	0
Driving a car	0	1	2	4	1
Taking the bus	2	0	2	3	0*
Taking part in outdoor recreational activities (biking, tennis, swimming, etc.)	0	2	1	4	2
Taking part in indoor recreational activities (movies, bingo etc.)	2	0	1	4	0*
Eating in restaurants	1	3	1	2	1*
Visiting friends/relatives	0	2	2	3	0
Going on a vacation trip	0	2	2	3	0

* Environmentally hypersensitive individuals are bothered by odours in stores, shopping malls, buses and public places.

** Not Applicable/No Answer (Tenant did not participate in this activity)

*** Compare the number in this column with the sum of the numbers in the first two columns. Those hampered with these activities before moving into the project who did not report improvement generally had no change since moving into the project.

2.5 Use of Health Related Services

Tenants were asked whether or not they had accessed one or more health-related services during the six months previous to the interview. The services included a family doctor, naturopath, acupuncturist, homeopath, environmental medicine physician and other medical specialists, as well as counselling services and community health centres. About half of the tenants had seen a family doctor and/or a medical specialist. Three tenants had visited an environmental medicine specialist. Other health related services were accessed by fewer tenants (two or less). These visits to the health professionals were not necessarily due to environmental hypersensitivities.

2.6 Sources of Information

Tenants receive information about their condition and how to cope from a variety of sources. Two of the seven families belong to an association (The Allergy and Environmental Health Association) or support group for people with environmental sensitivities. Another tenant is on the mailing list for the Allergy and Environmental Health Association but maintains she cannot afford the membership fee. Two other tenants have let their membership lapse for lack of funds.

Other sources of information, according to the tenants are:

- their doctor (most frequent source);
- articles in magazines and books;
- word of mouth (friends and neighbours);
- health food stores; and
- special lectures on the topic.

One tenant has not been able to find any helpful sources of information for her condition.

2.7 Social Support

In order to obtain an indication of the extent of social support available to them, tenants were asked how often in the week prior to the interview they had either visited or spoken on the phone with a friend or relative. One tenant reported having had no visits or telephone contacts with relatives or friends, and another tenant had only one contact. Most tenants, however, had telephone contacts and/or personal visits with relatives or friends a few times that week or daily.

3 TENANTS' PERSPECTIVE ON THEIR QUALITY OF LIFE

To obtain a measurement of the quality of life experienced by tenants of the Barrhaven Project, tenants were asked to rate (on a scale of 1 to 5, where 1 = very satisfied and 5 = very dissatisfied) their satisfaction level with specific aspects about the neighbourhood in general, the Project, and their own unit. The results of these rating are described below and depicted in Exhibits 3, 4 and 5. What the following sections will show is the diversity in responses with respect to "likes and dislikes" and the importance of different aspects for the quality of life.

3.1 Level of Satisfaction with Neighbourhood

Exhibit 3 shows that, for the most part, tenants are satisfied with the neighbourhood surrounding the Barrhaven Project. The majority (at least five of the seven families) of tenants, for instance, were satisfied (gave a rating of 1 or 2) citing: the availability of social and recreational activities; the availability of public transit; the proximity to convenience services such as the bank, a grocery store, beer store, video store etc.; the safety of the neighbourhood; and how neighbours respected their needs.

As a group, however, tenants expressed some dissatisfaction with the friendliness of their neighbours and the quality of the air outside¹. Only two families were satisfied with these aspects of the neighbourhood.

1. The dissatisfaction was largely due to pollutants in smoke from wood burning stoves and fireplaces at times during the heating season. Wood smoke coming into the units can be minimized by turning off the ventilation system temporarily when smoke is noticeable.

EXHIBIT 3**TENANTS' SATISFACTION WITH NEIGHBOURHOOD**

	NUMBER OF TENANTS WHO ARE SATISFIED	NUMBER OF TENANTS WHO ARE NOT SATISFIED	TOTAL NUMBER OF TENANTS WHO HAD AN OPINION
The availability of social and recreational activities	6	1	7
Proximity to convenience services such as the bank, grocery store, beer store, video store	5	1	6
Proximity to schools (if applicable)	3	0	3
Availability of public transportation	6	1	7
Availability of health and social services	4	2	6
How safe the neighbourhood is	5	2	7
How friendly the neighbours are	2	5	7
How the neighbours respect their needs	5	2	7
The quality of the air (eg. level of pollution, exhausts from other units, gas fumes, wood stoves)	3	4	7

Matters of Concern in the Neighbourhood

When asked for examples of things in the neighbourhood (outside the Project) that were a problem for them, tenants cited different concerns. These concerns included: the amount of pesticides used in the summer; neighbours' dogs perceived as vicious; the amount of garbage and articles stored outside by some neighbours; quarrels among neighbours; and the noise coming out of some apartments.

Best Features of the Neighbourhood

Each tenant was given an opportunity to talk about what they liked best about their neighbourhood. More than one tenant mentioned the bicycle paths, nature trail and the green space surrounding the neighbourhood giving it a "country like" atmosphere. Other positive features included:

- the friendliness of the neighbours in their Project (as opposed to the surrounding neighbourhood);
- the proximity to bus routes;
- the availability of a baseball diamond;
- the quietness of the neighbourhood;
- the aesthetically pleasing appearance of the grounds and buildings; and
- a general feeling of safety (minimum social problems, infrequent need for police etc.).

3.2 Level of Satisfaction with Project

Exhibit 4 displays the results of the tenants' satisfaction rating with the housing Project itself. The Exhibit reveals some mixed feelings about different aspects of the Project. For instance, only about half of the tenants reported being satisfied with the upkeep and general maintenance of the property and the responsiveness of the maintenance workers to their individual needs. Most tenants, however,

were satisfied with the responsiveness of the property manager, the overall appearance of the building and the assistance given to them by the Barrhaven Church. The majority of the tenants also gave a positive rating to the friendliness of their neighbours in the Project.

Matters of Concern in the Project

Some tenants, when probed, listed a few concerns they had with the Project. These included matters such as the proximity of the railroad track and the baseball diamond (the latter was a plus for another tenant)² and the amount of dog faeces and urine on the walking paths.

Best Features of the Project

When asked what they liked best about the Barrhaven Project, tenants mentioned features such as:

- the cleanliness (referring to elimination of sources of chemical pollutants typically found in other rental dwellings)³;
- the responsiveness of the Project management;
- the presence of children; and
- the quietness of the Project.

2. The reasons for the dissatisfaction with the railroad track or the baseball diamond were not stated but may be associated with noise.

3. Only selected, unscented cleaning materials are permitted for use in the units within the project; pesticides are not used in the baseball field or in the conventional units within the development.

EXHIBIT 4**TENANTS' SATISFACTION WITH BARRHAVEN
ENVIRONMENTAL PROJECT**

	NUMBER OF TENANTS WHO ARE SATISFIED	NUMBER OF TENANTS WHO ARE NOT SATISFIED	TOTAL NUMBER OF TENANTS WHO HAD AN OPINION
The upkeep and general maintenance of the property	3	3	6
The responsiveness of the maintenance workers to tenants' individual needs	3	3	6
The responsiveness of the property manager to tenants' concerns	5	2	7
The assistance and/or support given to tenants by the Barrhaven Church	4	2	6
The safety and security of the property	4	3	7
The friendliness of the other people living in the project	6	1	7
The overall appearance of the building	4	2	6

3.3 Level of Satisfaction with Unit

The questionnaire included some very detailed items about the different features of the unit itself. The ratings for each of these items are shown in Exhibit 5. Not all tenants were completely satisfied with the various features of their unit. Features that appear to be most satisfactory (at least 5 out of seven tenants are satisfied) are: the level of noise inside the unit; how soundproof the unit is from outside noise; and the special features to reduce odours from a television or computer.

The most dissatisfaction was expressed with features such as: the finishes on the floor, walls and ceiling⁴; the finishes on the maple counter top⁵; the colour of the unit, the ventilation system; and the instructions (or lack of) given on how to maintain the unit and its special features. More than half of the tenants (four out of seven) claimed that they were only somewhat or not at all familiar with how the mechanical system works⁶. Due to this general lack of understanding by the tenant, one unit had the ventilation system turned off most of the time.

As described earlier in Section 1, the interviewer was accompanied by a specialist in environmental sensitivities who acted as an independent assessor of the unit's features and its impact on the tenant's health. The observations made by the independent assessor support some of the tenants' concerns expressed above. According to the assessor's observations, the wood counter tops are inadequate and appear not to be environmentally sound. They are prone to cracking and splitting thus making mold growth inevitable. As well, the assessor noted the wood odours and the lack of sealant on the wood stairs.

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4. Mostly, dissatisfied tenants found the materials and grey colour of the concrete block walls and polished concrete floors depressing and cold. Two tenants felt that one coat of sealant on the basswood paneling was insufficient.
 5. Tenants found the maple butcher block counter top difficult to maintain. Wood gets stained or soiled easily.
 6. At the time each tenant moved in, the heating and ventilation system was explained and instructions on cleaning the filters were given. A similar briefing was given on another occasion. Because the ventilation system is novel and most people have not encountered it before, many of the tenants found it difficult to understand how it operates.
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EXHIBIT 5**TENANTS' SATISFACTION WITH UNIT**

	NUMBER OF TENANTS WHO ARE SATISFIED	NUMBER OF TENANTS WHO ARE NOT SATISFIED	TOTAL NUMBER OF TENANTS WHO HAD AN OPINION
The size of the unit	4	3	7
The size of the rooms	4	3	7
The general layout of the unit	3*	4	7
The amount of storage space	3*	4	7
The level of natural lighting	3*	4	7
The finishes on the floors, walls, ceilings	1*	6	7
Counter top material	1*	6	7
The colour of the unit	2*	5	7
The heating system	4	3	7
The ventilation system**	2*	5	7
The quality of the air in the unit	4	3	7
How easy it is to clean and look after the unit	4	3	7
How soundproof the unit is from outside noise	5	2	7
How soundproof the unit is from noises made by neighbours	3*	4	7
The level of noise inside the unit	6	1	7
The special features (glass cupboards) to reduce odours from T.V. and computer	5	2	7
The instructions given on how to maintain the unit and its special features	1*	4	5

* Represents less than half of the tenants interviewed

** Attributes of the ventilation system include visibility of ducts, air noise, understanding how it works and maintenance.

Matters of Concern in the Unit

There were a few concerns about the features of the unit raised by at least four different tenants. These concerns included matters such as: the relatively small water tank (only enough for one shower); the smell of the wood (smells like anti-freeze); the fact that there is no laundry sink; and lack of storage space.

Tenants were asked if there was any special feature, which in their opinion, was not useful and did not help at all. Every tenant interviewed had an opinion. Features that were not helpful, according to tenants, included:

- the stove fan because it does not vent to the outside;
- specially designed lighting fixtures were not needed; one tenant mentioned that he could not change the bulb ⁷;
- glass cupboard was seen as least useful by one tenant; and
- one tenant was of the opinion that cheaper wood could have been used and properly sealed.

Tenants were also asked if there were too many restrictions placed upon them with regard to the special features and their use. The general consensus was no. In fact, one tenant was of the opinion that it would help to have a list of what is allowable. (Tenants, upon occupancy, were given a list of suggested recommendations on acceptable products for the care of the unit.)

7 The lighting fixtures are standard. Replacement of a bulb involves removal of the glass cover first - a task found cumbersome by the tenant.

Best Features of the Unit

The best features of the unit, according to the tenants are:

- the air quality;
- the ventilation system (when it is on);
- easy to heat in the winter;
- cosy, unique, earthy atmosphere;
- quiet; and
- being near other people with allergies (can share ideas; support each other).

Observations Made by the Independent Assessor

The independent assessor made the following observations about the units. In her expert opinion:

- it would be imperative to have the ventilation turned on. The fact that one tenant had the ventilation turned off most of the time would make it very difficult to assess the impact of the unit on her health;
- the effectiveness of a few units are compromised because they were very dusty and overcrowded (with furniture and possessions);
- some doors were swelling and not closing;
- storage is very inadequate. This has produced crowded areas which are very difficult to clean especially where there are children involved;
- the floors, walls and stairs require additional sealing;
- the lack of windows in the back of the units has the potential for increasing Seasonal Affective Disorder; and

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- there is insufficient lighting (there are no windows in the bathrooms and some units do not have a window in the kitchen)⁸.

3.4 Perceived Social and Health Impacts

In order to assess whether or not the Barrhaven Project had a perceived positive impact on the health and social life of the tenants, several retrospective questions were asked in the evaluation interview with families.

First, tenants were asked whether or not their tolerance level had changed with respect to their particular symptoms. Some tenants have noted improvements since moving to the Barrhaven Project. For example, one tenant reported that her energy level and concentration was better. Another tenant indicated that her breathing improved and she is able to sleep better. However, other tenants were not as positive. In fact, four tenants have not noticed any improvements in their health, and for one tenant, her food allergies have become worse. Another tenant reported that the inadequate natural lighting was making her sick.

Second, when tenants were asked, if their original expectations about living in the Barrhaven Project had been met, three tenants indicated no, two indicated yes, and two did not know. Reasons why expectations were not met, according to tenants, included:

- more expensive than expected (referring to costs associated with electric heating and running the ventilation system);

8. Because of the limitation of the design imposed by the available funding for the project (see p.4), maximizing natural lighting through the windows that are supplied assumed even greater importance. CMHC recommended to the building team to install clear rather than low-E (low emissivity) windows, which were specified in the original design. Low-E windows have coating on the glazings which prevent heat loss during the heating season and overheating during the warm months. The presence of such coatings, however, cuts down the amount and quality of light transmitted by the window to the interior (refer to V. Salares and P. Russell, "Energy-Efficient Windows, Lighting and Human Health," Proceedings of the 7th International Conference on Indoor Air Quality and Climate, vol. 4, pp. 231-236, 1996). Support for the suggestion to use clear glass rather than low-E was provided by the results of testing of window assemblies by a panel of hypersensitive individuals. If low-E windows had been used, the lighting level would have been even less acceptable.

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- inadequate natural lighting is distressing;
 - culture shock because did not want to move in the first place;
 - lack of room; can't sleep in small places; and
 - no sealant on wood walls or floor which resulted in residual odours; if known, would not have moved (note-one coat of sealant was in fact used which proved to be inadequate).

A third indication of the success or failure of the unit to improve the tenants' quality of life was a summary question asking tenants how satisfied they were (again using the 1 to 5 scale) with their overall quality of life taking all things into account. Three tenants reported being satisfied; two felt neither satisfied or dissatisfied; and two were dissatisfied. When asked how they would rate their quality of life now compared to one year ago, the vote was mixed. Two tenants felt it was the same; two felt it was worse; and two felt it was better.

A final retrospective question asked tenants whether or not their general outlook on life has changed since moving to the Barrhaven Project. Again, the results were mixed. Four tenants reported that their outlook had changed for the better, and two tenants were of the opinion that their outlook had not changed at all. One tenant's comment reflected the mixed nature of the responses. She said that she was encouraged because her physical health had improved, but discouraged because she was lonely.

3.5 The Future

For the most part, the families living in the Barrhaven Project were not able to predict exactly how long they would continue to live in Barrhaven. Two families saw their tenancy as a shorter term solution - from six months to a year. Another tenant felt she could live in Barrhaven forever, while another wanted to move as soon as possible. One tenant expressed a feeling that she had no choice in housing options due to her health condition.

The two families who expected to move in the near future both had a desire to own their own home. One planned to build a home and incorporate many of the same features such as the special ventilation system. The other family wished to own their own home in order to be able to choose the neighbourhood and their neighbours. They also hoped to be able to incorporate some of the special features (including features from CMHC's Research Demonstration House for the Environmentally Hypersensitive) into their new home.

When asked how they felt about living in a community with other people who have similar health related concerns, all tenants were in agreement that this setting was beneficial. The positive aspect of this arrangement was that neighbours were able to share information with each about their concerns. On the other hand, one tenant reported that it was sometimes depressing to listen to other peoples' problems.

4 PERSPECTIVE OF THE LANDLORD AND MANAGEMENT

To obtain the perspective of the landlord, interviews were conducted with the minister of the Barrhaven United Church and the housing manager of the 41 unit development which includes the Barrhaven Project.

The role of the landlord, according to the minister, was to develop a community among the 41 families of the non-profit housing development including the seven units occupied by tenants with environmental hypersensitivities. In some cases, the church also provided some basic necessities for tenants. For example, one tenant in the Barrhaven Project required an expensive hospital style bed. A second-hand bed was purchased and donated to the tenant by the Church.

According to the minister of the Barrhaven United Church, the Barrhaven Project has been a learning experience for the landlord (Barrhaven Non-Profit Housing Board). Although previous experience in the provision of social housing guided the landlord through the process, the unique health related needs of these tenants provided some challenges in assisting tenants to settle into the community. If the Project were to be repeated, the following should be strongly considered in the opinion of the minister:

- a common room or area should be incorporated into the housing project for tenants with environmental hypersensitivities;
- clear and realistic expectations about the role of the landlord as well as what is expected of tenants need to be articulated in a landlord/tenant agreement (for instance, in one case, it took three months to enforce a "no pet" ruling because this was not clear at the outset);
- selection criteria and a screening process need to be well defined (in the opinion of the landlord, the health related problems of some tenants may have been too severe and have influenced the potential impact of the housing unit); and
- tenants require clear and simple instructions on how the special features function as well as "do's and don'ts" with respect to daily maintenance.

The housing manager's comments and suggestions concurred with the recommendations above. In her opinion, tenants in the Barrhaven Project appear to be happy. However, some issues⁹ have been brought to her attention, including:

- the absence of an operating manual for the ventilation system;
- the absence of written guidance concerning appropriate cleaning products;
- the absence of "fact sheets" about the unit in general and how to improve the living space;
- a need for conflict resolution assistance among some tenants; and
- a need to involve tenants in the management of the project through a tenant committee or active representation on the Board.

The housing manager noted that tenants in the Barrhaven Project interact more with each other than with families living in the development at large.

9. Information containing operating and maintenance instructions for mechanical systems, cleaning and maintenance of materials, explanations of the design, explanations of anticipated additions by the tenants, etc. was provided by the design/engineering/construction team to Barrhaven Non-profit Housing out of which a housing manual was to be produced. This manual never materialized. The tenants were briefed several times on operating the mechanical system.

5 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations can be made about the impact of the Barrhaven Project on the quality of life of the tenants. These conclusions are based on the integrated results of interviews with tenants (summarized in the case examples in Exhibit 1) and the landlord, including the housing manager. The recommendations come from the tenants themselves as well as the consultants' observations. They are meant to provide guidance to other organizations who may be considering a similar endeavour.

5.1 Conclusions

The results of the interviews with tenants of the Barrhaven Project showed that there were perceived health benefits gained from living in the units. These benefits may be attributable to the special features incorporated into the units. Five out of the seven families noted some improvements with respect to their symptoms and/or functional capabilities over the first year of their tenancy. In one case, a child with severe asthma, the health improvement, according to the father, was very dramatic. This particular child had spent months in the hospital prior to occupancy. Since moving to the Barrhaven Project, no hospital stays have been required, nor visits to the emergency department and medication use has been reduced substantially.

One tenant indicated that there was no real change in her condition. However, this was mainly because her previous environment was also healthy. For another tenant, her perception was that her condition has continued to deteriorate. It should be noted that this tenant was severely disabled (in terms of her environmental hypersensitivities) and had other compounding difficulties with respect to life skills that may have impacted on the outcome.

With respect to the special features, there was general agreement among almost all tenants that the ventilation system was very beneficial to their health (with one exception). This was in spite of the fact that most tenants did not know how to operate or maintain the system (i.e., how and when to change filters). Written instructions were minimal, and according to all parties, not very clear.

Tenants' ratings of other features in the unit were less positive. Most tenants did not like the cement walls and floors. They found the grey colour depressing and the floors cold. As well, many tenants found the units to be too dark (which according to them negatively affected their health). As a result, some tenants spent as much time as possible outdoors. Others added their own halogen lights.

Another was the wooden counter in the kitchen. Many of the tenants (supported by the independent assessor) were of the opinion that there was not enough sealant on the counter to prevent the growth of mold. It is also difficult to keep the counter clean. The odour of the wooden stairs was a problem for some tenants but not mentioned by others.

Most of the tenants like the neighbourhood. The location was seen as very accessible to needed convenience services although for tenants who worked outside the home, it was quite far to travel to work. This in fact caused one tenant to quit her job. Her health was affected by the long bus trip.

Most tenants also liked the segregated setting of the housing Project. Almost all spoke of sharing information with each other and providing mutual support. Although the Project was segregated, the neighbourhood had an integrated feel to it, according to one tenant. The green space and walking trails were appreciated by most tenants.

Tenants were not heavy users of health and social services. Several tenants had seen their family doctor and/or a specialist during the last six months and a few tenants had seen an environmental medicine specialist. Two tenants would benefit from the services of a homemaker. One tenant, for instance, suffered from constant fatigue which she claimed made it difficult for her to keep the apartment tidy. The dust and general disarray, unfortunately likely also contributed to her loss of energy.

5.2 Recommendations

Recommendations from the Tenants

The families living in the Barrhaven Housing Project contributed their personal experiences gained from living in the unit for at least one year. When asked for suggestions and recommendations that they would pass on to a builder or a housing developer considering this housing option, almost all of the tenants interviewed provided concrete ideas. Summarized, these suggestions and recommendations were:

- rooms should be bigger;
- more natural light is needed;
- consider hardwood floors rather than cement¹⁰;
- consider metal or ceramic counter tops¹¹;
- consider alternative to concrete walls (too grey);
- yard should be larger;
- need more storage space;
- try making ventilation pipe less visible;
- add heating under floors; and
- pay more attention to "social" aspects of building a community.

10. Hardwood floors involve higher costs and have the disadvantage of releasing odours from the woods and finishes. If the budget allows, the preferred flooring is ceramic tile on cement. Ceramic tiles are inert, durable, attractive and do not require finishing.

11. Ceramic counter tops are not recommended because of the difficulty of keeping the grout clean. Metal counter tops would look institutional. The preferred materials are high density counter tops such as Corian™ or melamine on a base other than particle board (e.g., softwood plywood). All surfaces of the base material should be sealed.

Recommendations from the Consultants

The following recommendations are based on the consultants' observations and interpretations of the results. They include the opinions of a specialist in environmental hypersensitivities. Based on the results of this study, other organizations that are planning a housing project for persons with environmental hypersensitivities should consider:

- the articulation of clear selection criteria to assist in the screening of applicants (e.g., tenants must be capable of independent living);
- involving tenants in a meaningful way in the management of the housing project so that tenant expectations are realistic and a sense of ownership is developed;
- providing a link to health and social services in the community by making tenants aware of available resources;
- if possible, encourage local applicants who have family and friends nearby as this is an important source of informal support;
- explore design options that will make the units more aesthetically pleasing as well as functional (i.e., plaster rather than cement walls; wood floors) as this is particularly important for these tenants who spend a lot of time indoors;
- have a simply written landlord/tenant agreement that articulates the expectations and responsibilities of both parties;
- have a simply written instruction manual on how to operate and maintain the special features; the manual should also include products and materials to avoid and other helpful hints; and
- form partnerships with other organizations knowledgeable in the area (such as The Allergy and Environmental Health Association) during the development of the housing project.

5.3 Interpretation of the Results: Comments From Canada Mortgage and Housing

It should be recognized that the sample size is small and many factors, including the tenants' backgrounds, state of health, individual coping skills and financial status, can affect the tenants' perceptions of whether or not the building has fulfilled their needs and expectations. It is also important to bear in mind that even the cleanest and purest environment is not necessarily going to accomplish a reversal of physical health from a chronic condition to a state of wellness. In the short period of time that the tenants have lived in the Barrhaven Project, small changes, such as increased feelings of well-being or absence of irritation to pollutants normally encountered in ordinary housing, are more realistic expectations than becoming totally healthy.

In assessing the impact of this building on the health of the tenants, the symptoms that should be evaluated must be relevant to the quality of air in the units. Symptoms associated with eczema and food allergies, for example, are more directly affected by food intake than from the air they breathe, though the quality of air may have an indirect effect. Thus, for these people, diet management is more critical than the quality of the air. Similarly, the inability of individuals with environmental hypersensitivities to ride a bus or visit malls or restaurants is likely due to limitations in the air quality in these locations and not related to the quality of the air in the units. Lack of improvement in the tenants' ability to undertake such activities is not a reflection of the livability of the units.

The critical question to be answered in this research is whether the occupants of the Barrhaven Project feel a sense of well being inside their own unit and how this compares with other places they have lived before. One tenant who moved from the controlled environment of her parent's house to live on her own, has been able to maintain her state of health. Other tenants reported experiencing increased health related benefits in their day-to-day lives, although not all were able to give unqualified satisfaction ratings to the various features in the units. The reported benefits included: improved concentration permitting the tenant to work; the ability to breathe better; improved energy

level; improved brain functioning and sleeping; reduction of symptoms and reduced asthma medication and incidence. These reported benefits are significant.

Another positive indicator is the fact that none of the original tenants moved out because of inability to tolerate the place. Typically, sensitive people have difficulties with newly constructed buildings because of emissions from new building materials. The stable tenure of the occupants suggests that their needs are being met.

The modifications suggested by the tenants are worth considering in future developments of this nature. Selection of materials has to be done carefully, but at the same time, the visual impact of the materials on the occupants is very important. The substitution of one material over another (e.g., visually more aesthetic hardwood over polished concrete) must be evaluated on the basis of ease of maintenance, durability and emission levels from the materials. While many choices can be improved, the cost factor will ultimately affect the choices.

Tenants have a responsibility of using and operating the building in a manner consistent with the original intent of providing an environment that has exceptional air quality and is acceptable to hypersensitive individuals. Lifestyle may have to be adjusted for this purpose. Because of the limited space in each unit, restraint is called for in storing a lot of furniture and belongings. The indoor spaces would be easier to keep clean, and air circulation would be unobstructed.

While good air quality is recognized for environmentally hypersensitive individuals, good lighting is equally important. On the basis of the experience in this project, it is suggested that future projects to house environmentally hypersensitive individuals pay close attention to daylighting. Generous daylighting should be provided, and clear glass windows should be used. If possible, windows should be provided to all rooms, including bathrooms. If this is not at all feasible, the second choice is supplementary daylighting by means of skylights, light pipes or transoms. These, however, will

involve incremental costs.

Though the tenants recommend a number of improvements, the concepts in the design and construction of these units are exemplary. Sources of chemical pollutants commonly found in typical housing (carpets, particle board and other pressed woods, oil paints, odorous latex paints, plastics, rubber, insulation, tar) have been meticulously excluded both by careful selection of materials and superior building techniques. Low levels of chemical contaminants are among the top-rated attributes of the kind of housing desired and needed by people who suffer from environmental hypersensitivity (*Housing Needs of the Environmentally Hypersensitive: Socio-economic/ Health Factors*, CMHC, 1997).

The design (insulated slab, no basement), construction (airtight and energy-efficient) and ventilation system (provided the ventilation is operated the way it is intended), render the building an unlikely candidate to become moldy over time. The tenants' evaluation of the units relate to their perception of the units as these are occupied on a day-to-day basis. Not articulated in their responses is the desirability of a building which is not moldy, an aspect which can be appreciated much more keenly while one is actually living in or is affected by a moldy environment.

The benefits of continuous and balanced ventilation (with a Heat Recovery Ventilator), a relatively new system not usually found in standard housing, are not immediately obvious to the occupants, but would be appreciated more as familiarity with the ventilation system is gained.

The desirability of a building where tenants are not exposed to odours produced by other tenants (e.g., cigarette smoke, perfumes) should be recognized. To find a building or neighbourhood where pesticides for controlling cockroaches or weeds are not used is an exception rather than the rule.

Lastly, to have a landlord who understands the importance of all these issues and is fully supportive of the needs of the tenants is a rarity.

For all these reasons, what may appear to be less than perfect characteristics of the units as perceived by the tenants are minor. **The project has been successful.**

Several conclusions can be made:

1. This project is equally valuable for the lessons that can be learned from it as for its benefits to the tenants.
2. Many of the improvements suggested by the tenants can be implemented in subsequent designs.
3. Tenants must not come with expectations that specially designed and built housing is a cure all. They must share in the responsibility of maintaining the air quality for themselves and for future tenants.
4. This project underlines the need for units of this kind of housing to be built elsewhere. The people would not have to move far from family support. The fact that some did move so far attests to the need for such housing.

The Barrhaven United Church, the Ministry of Housing for Ontario and the design and construction team deserve recognition for pioneering and meeting the challenges of providing housing for persons with environmental hypersensitivities.

APPENDIX

Low-Cost Dwellings for the Environmentally Hypersensitive

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Canada Mortgage and Housing Corporation