

Impact sonore de la circulation
sur l'Autoroute 40
des chaînages 265-00 et 320-00
(Boulevard de la Capitale - Québec)

CANQ
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201

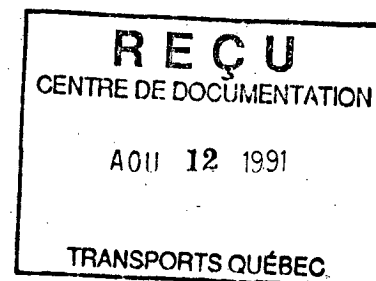
MINISTÈRE DES TRANSPORTS
Centre de documentation
35, rue de Port-Royal Est
3e étage
Montréal (Québec)
H3L 3T1

472808

GOUVERNEMENT DU QUEBEC
MINISTERE DES TRANSPORTS
DIRECTION GENERALE DU GENIE
SERVICE DE LA CIRCULATION

DIVISION DES ETUDES DE L'ENVIRONNEMENT

Impact sonore de la circulation
sur l'Autoroute 40
des chaînages 265+00 @ 320+00
(Boulevard de la Capitale, Québec)



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Yves Ste-Marie
Yves Ste-Marie, physicien

1978-04-07

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RECOMMANDATIONS

- Attendu que le Ministère n'a pas encore défini sa politique en ce qui a trait au bruit issu des routes et autoroutes provinciales,

je recommande au Ministère d'adopter, d'ici là,
les normes fédérales américaines (FHPM-7-73) reliant
le niveau L_{10} à l'utilisation des terrains.

(voir Annexe 2, page 35)

- Attendu qu'un modèle de simulation approuvé par le FHWA (NCHRP #174) nous donne, pour le tronçon d'autoroute à l'étude, des niveaux L_{10} (durant l'heure de pointe en 1990) excédant les normes américaines,
(voir Annexe 2, page 35)

je recommande au Ministère des Transports d'adopter
les mesures correctives qui sont décrites à la page 7 et 8
de ce document.

MODELE DE SIMULATION

Le modèle de simulation utilisé pour cette étude d'impact sonore est présenté dans le rapport:

NCHRP # 174 " Highway Noise - A Design
Guide for Prediction and Control - 1976 "

Celui-ci est approuvé par le FHWA pour fins d'étude d'impact sonore pour une future autoroute. Il nécessite l'assistance d'un ordinateur et est précis, selon les auteurs, à ± 2 dB (A). De tous les modèles de simulation utilisés aux Etats-Unis pour des études d'impacts, celui-ci est présentement le plus précis et le plus sophistiqué.

DONNEES DE CIRCULATION

Selon Monsieur Marcel Huard, chef de la Division des Inventaires Routiers du Service de la Circulation, à Québec, le JMA pour la section de l'autoroute 40, entre les boulevards Duplessis et Henri IV, serait de 20 000 et ce, pour 1980. L'augmentation annuelle du JMA serait de 5% et le débit horaire durant les heures de pointes serait environ 10% du JMA. La concentration de camions (3 essieux et plus) durant ces heures de pointes pourrait varier entre 6% et 12%.

Cas étudiés

- 1er cas - année 1990
- augmentation annuelle du JMA de 5%
 - débit durant les heures de pointes $\approx$ 10% du JMA
 - 6% de camions (3 essieux et plus)
- 2e cas - année 1990
- augmentation annuelle du JMA de 5%
 - débit durant les heures de pointes $\approx$ 10% du JMA
 - 12% de camions (3 essieux et plus)

On obtient donc pour les différents cas étudiés:

1er cas - 32 578 véhicules/jour, en 1990
 3 258 véhicules/h durant les heures de pointes
 soit:
 195 camions/h et 3 063 autos/h
 ou approximativement
 200 camions/h et 3 050 autos/h

2e cas - 32 578 véhicules/jour, en 1990
 3 258 véhicules/h durant les heures de pointes
 soit:
 391 camions/h et 2 867 autos/h
 ou approximativement
 400 camions/h et 2 850 autos/h

Pour avoir une certaine marge de sécurité, on peut supposer une augmentation annuelle de 7% pour le JMA; on obtient alors les deux autres cas, soit:

3e cas - débit durant les heures de pointes $\approx$ 10% du JMA
 - 6% de camions (3 essieux et plus)
 on obtient alors:
 - 39 342 véhicules/jour, en 1990
 - 3 934 véhicules/h durant les heures de pointes
 soit
 - 236 camions/h et 3 698 autos/h
 ou approximativement
 250 camions/h et 3 700 autos/h

- 4e cas
- débit durant les heures de pointes $\approx$ 10% du JMA
 - 12% de camions (3 essieux et plus)
- on obtient alors:
- 39 342 véhicules/jour, en 1990
- 3 934 véhicules/h durant les heures de pointes
- soit
- 472 camions/h et 3 462 autos/h
- ou approximativement
- 450 camions/h et 3 450 autos/h

RESULTATS OBTENUS A L'AIDE DU MODELE DE SIMULATION

Le modèle utilisé nous a permis de tracer des courbes isophones du niveau L_{10} (1 h) pour les quatre cas étudiés. Ces courbes sont illustrées dans le cahier de cartes accompagnant ce rapport. L'étude de celles-ci nous permet de conclure que les conditions de circulation des cas 2 et 4 sont les plus bruyantes. Nous avons donc tenté d'optimiser les correctifs (barrière anti-bruit) pour ces cas extrêmes. La description des barrières anti-bruit est donnée à la page 7 de ce rapport. Les courbes isophones obtenues pour les cas 2 et 4, lorsque ces barrières sont présentes, sont illustrées dans le cahier de cartes. De plus ces cartes indiquent la position des barrières anti-bruit.

MESURES CORRECTIVES

Côté nord de l'autoroute:

	Hauteur de la barrière anti-bruit par rapport au niveau de la chaus- sée nord de l'autoroute	Distance entre la barrière et le C_t	Chaînage
1)	12 pi.	125 pi.	262+00 @ 277+00
2)	12 pi.	125 pi.	278+00 @ 282+00
3)	14 pi.	100 pi.	282+50 @ 287+50
4)	14 pi.	125 pi.	288+00 @ 297+50
5)	12 pi.	125 pi.	299+00 @ 315+00
6)	12 pi.	125 pi.	315+00 @ 323+00

Entre les chaînages 316+00 et 326+00, l'autoroute sera en dépression;
 toutefois, il faudra s'assurer que la hauteur minimale entre la chaussée
 et le haut de la barrière anti-bruit # 6 soit de 12 pi. tout au long
 du tronçon.

Côté sud de l'autoroute:

	Hauteur de la barrière anti-bruit par rapport au niveau de la chaus- sée sud de l'autoroute	Distance entre la barrière et le CL	Chainage
1)	12 pi.	125 pi.	298+50 @ 319+50
2)	12 pi.	125 pi.	289+50 @ 297+00
3)	12 pi.	100 pi.	284+00 @ 289+50
4)	12 pi.	125 pi.	278+00 @ 284+00
5)	12 pi.	125 pi.	264+50 @ 276+50

NOTE:

L'efficacité de ces barrières anti-bruit pourrait être accrue en les rapprochant du bord de la chaussée, ou en les élevant par rapport au niveau de celle-ci.

CLIMAT SONORE EXISTANT

Pour bien connaître le climat sonore sur les terrains adjacents à la future autoroute, il aurait été idéal de prendre des relevés à plusieurs endroits le long du tronçon à l'étude. Malheureusement, à cause du manque de personnel, nous avons dû nous limiter à deux échantillonnages faits à l'aide de l'unité SP-321 de B & K. Les positions de ces relevés sont indiquées sur la carte à la page 26 . Une étude des lieux nous permet de supposer que les résultats obtenus au deuxième point d'échantillonnage sont valables pour l'ensemble de la section à l'étude, i.e.: les rues Jandomien, Place de l'avenir, Panneton, etc...

Enregistrement # 1

L'enregistrement a été pris en bordure de l'emprise de la future autoroute et de la rue St-Cyrille, à l'Ancienne-Lorette, à $\approx 175'$ de la rue Notre-Dame. (voir carte à la page 26)

Résultats obtenus

Le graphique à la page 13 illustre très clairement l'importance des crêtes sonores causées par le passage des avions. (voir aussi L_1 et L_{Max} , pages 11 et 12). La présence de l'aéroport perturbe fortement le climat sonore de la région à l'étude. En effet, le L_{Max} moyen durant la période d'enregistrement est donné par l'équation suivante:

$$L_{Max} \text{ moyen} = \sum_{i=1}^n L_{Max}(i) \approx 79 \text{ dB (A)}$$

ex.: $L_{Max} (3) = 78 \text{ dB (A)}$ voir tableau page 11

Le niveau L_{Moy} demeure relativement constant: oscillant entre 50.84 et 55.57 dB (A). (voir tableaux aux pages 11 et 12)

Pour sa part, le bruit de fond (L_{95}) est caractéristique d'une zone résidentielle active. (variation entre 43 et 51 dB (A)).

Discussion: L'intensité des niveaux L_{Max} et L_1 , enregistrés au point d'échantillonnage # 1 est due à la proximité de l'aéroport.

Pour ce qui est des niveaux L_{eq} , L_{Moy} , L_{10} , L_{50} et L_{95} , les valeurs obtenues sont représentatives d'une zone à grande activité. (Rue St-Cyrille, près de la rue Notre-Dame).

ENREGISTREMENT # 1

DATE: 1977 09 08

LIEU: A-40, Ancienne Lorette, intersection de la rue St-Cyrille

PERIODE: 06:30 h. - 19:31 h.

	P E R I O D E														
	6:30 7:00	7:00 7:30	7:30 8:00	8:00 8:30	8:30 9:00	9:00 9:30	9:30 10:00	10:00 10:30	10:30 11:00	11:00 11:30	11:30 12:00	12:00 12:30	12:30 13:00	13:00 13:30	13:30 14:00
L_{max}	63	80	78	76	76	89	85	79	78	70	81	78	99	72	72
L_{eq}	52.37	56.50	57.58	58.58	56.70	67.46	63.00	59.28	58.22	53.67	59.84	56.90	71.65	53.88	55.44
$L_{80\%}$	50.84	52.75	53.65	54.09	52.32	55.57	52.65	51.66	53.73	52.04	54.37	53.19	53.78	52.21	52.22
OT	2.72	3.55	4.29	4.93	4.93	8.63	7.43	6.42	5.56	3.19	4.58	4.58	5.99	3.10	4.43
L_1	63	70	69	71	68	80	77	72	68	62	73	67	80	62	66
L_{10}	54	56	59	61	59	70	62	61	62	56	60	59	60	56	59
L_{50}	50	52	53	53	51	53	51	50	52	51	53	52	52	52	51
L_{95}	48	49	48	48	46	46	43	44	47	48	49	48	48	48	47

ENREGISTREMENT # 1

DATE: 1977 09 08

LIEU: A-40, Ancienne Lorette, intersection de la rue St-Cyrille

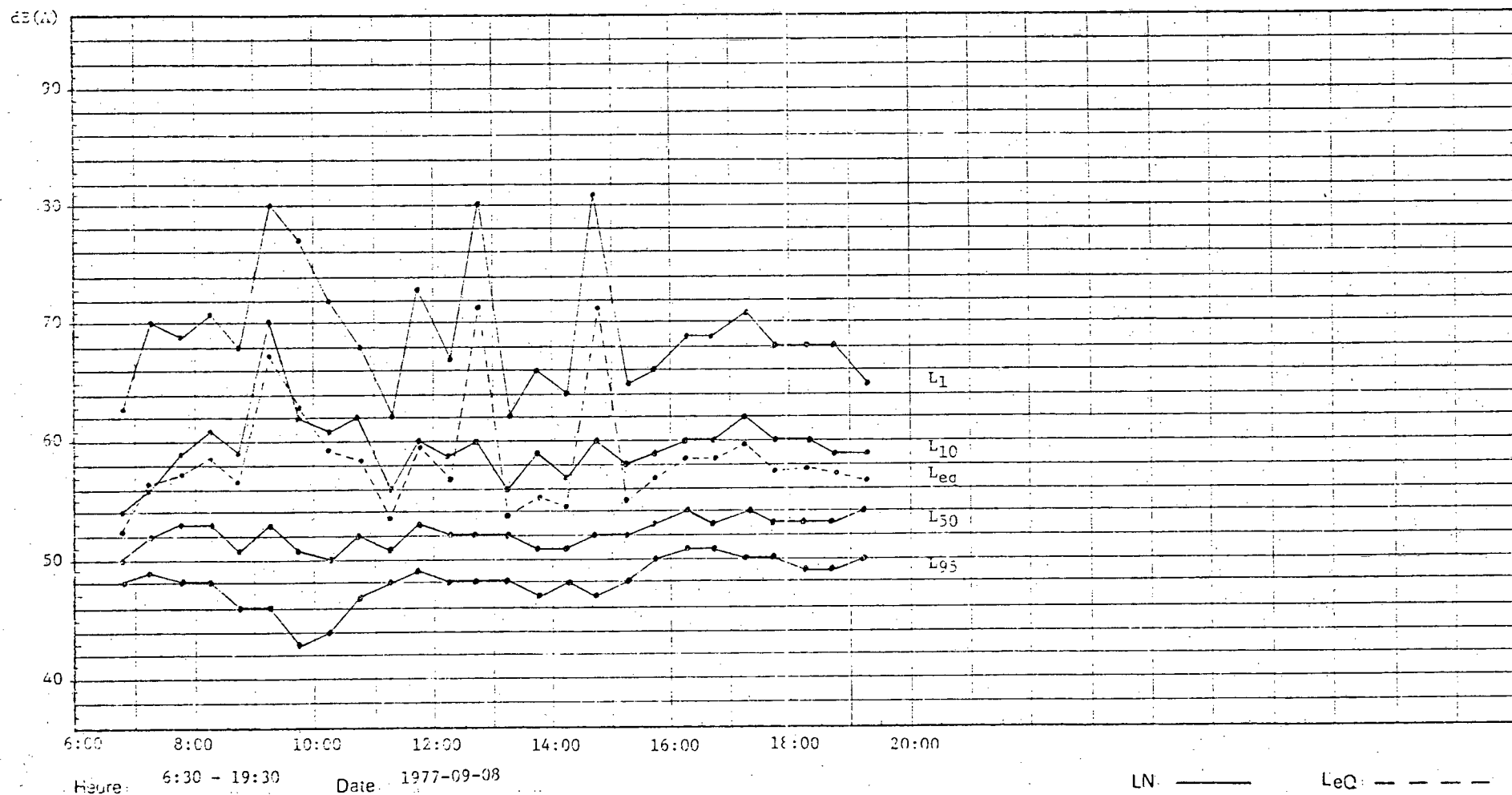
PERIODE: 06:30 h. - 19:31 h.

	P E R I O D E														
	14:00 14:30	14:30 15:00	15:00 15:30	15:30 16:00	16:00 16:30	16:30 17:00	17:00 17:30	17:30 18:00	18:00 18:30	18:30 19:00	19:00 19:30				
L _{max}	77	100	72	75	78	82	79	76	81	76	78				
L _{eq}	54.42	71.57	55.30	56.92	58.36	58.28	59.63	57.48	57.94	57.23	56.73				
L _{moy}	52.16	53.68	52.66	54.15	54.26	54.62	55.32	54.38	54.10	54.11	54.31				
σ	3.47	6.06	3.73	3.79	3.96	4.07	4.65	4.11	4.47	3.94	3.49				
L ₁	64	81	65	66	69	69	71	68	68	68	65				
L ₁₀	57	60	58	59	60	60	62	60	60	59	59				
L ₃₀	51	52	52	53	54	53	54	53	53	53	54				
L ₉₅	48	47	48	50	51	51	50	50	49	49	50				

ENREGISTREMENT # 1

COMPORTEMENT DES NIVEAUX L_1 , L_{10} , L_{50} , L_{95} & L_{eq}

Lieu A-40 Ancienne Lorette, intersection de la rue St-Cyrille



ENREGISTREMENT # 1Commentaires:

Les deux pointes sonores enregistrées entre 12:30 @ 13:00 heures et 14:30 @ 15:00 heures sont dues aux passages d'avions de type " Jet " au-dessus de la zone à l'étude.

Le climat sonore de cette zone est directement relié à l'activité aérienne de l'aéroport de l'Ancienne-Lorette où, pendant la période d'échantillonnage, pas moins de 51 appareils (avions, hélicoptères, etc...) ont sillonné le ciel.

Gilles Fontaine
Gilles Fontaine, tech.

Division des Etudes de l'Environnement

1977-09-08

1977-09-08

A-40 Ancienne Lorette

Départ de l'appareil à 6:30: ~~40~~ vent nul

N.B.: Rue Notre Dame: achalandée

7:13 Démarrage Jeep à proximité ($\approx 10'$)
7:40 Bruit: décollage d'un avion vers l'ouest
7:56 Décollage avion léger puis passage au-dessus
8:02 Décollage avion léger puis passage au-dessus
8:04 Décollage avion léger
8:07 Décollage avion DCX vers l'Est
8:09 Décollage hélicoptère puis passage
8:22 Décollage avion Québécois vers l'Est
8:28 Décollage avion léger vers l'Est
8:37 Décollage avion léger puis passage au-dessus
8:41 Décollage avion léger puis passage au-dessus
8:42 Décollage avion Québécois vers l'Est
8:44 Décollage avion Québécois vers l'Est
8:53 Sirène de police
8:55 Décollage avion léger vers l'Est
9:15 Décollage avion vers l'Ouest
9:35 Décollage avion vers l'Ouest
9:47 Décollage avion léger vers l'Est
9:56 Cloches de l'église jusqu'à 10:00 heure et passage d'un hélicoptère
10:01 Passage d'un avion léger
10:15 Décollage avion Québécois $\rightarrow$ Est $\rightarrow$ Sud
10:19 Décollage avion léger $\rightarrow$ Est $\rightarrow$ Sud
10:20 Décollage avion léger vers l'Est
10:22 Passage d'un hélicoptère pour atterrissage
10:28 Décollage avion léger vers l'Est
10:32 Cloche de l'Eglise jusqu'à 10:37 heure
10:34 Passage d'un hélicoptère $\rightarrow$ Sud $\rightarrow$ Est
10:45 Décollage d'un avion léger vers le Sud
10:46 Décollage d'un avion léger vers le Sud
10:47 Passage d'un avion léger Est-Ouest

10:54 Décollage d'un avion léger vers l'Est
10:56 Décollage d'un avion léger vers le Sud
11:07 Décollage d'un avion léger vers le Sud
11:28 Passage d'un avion léger Ouest-Est
11:31 Décollage d'un avion léger Nord-Est
11:31 Cris d'oiseaux dans bosquet d'arbres
11:36 Passage d'un avion léger (pas de bruit) passage d'un camion
11:41 Passage d'un avion léger Ouest-Est
11:43 Passage d'un avion léger Ouest-Est
11:48 Passage d'un avion léger Ouest-Est
11:52 Passage de 2 avions légers Ouest-Est et Sud-Nord
11:59 Décollage d'un avion Québécois vers l'Est
12:03 Cloches de l'église
12:32 Décollage d'un Jet vers l'Est
13:48 Décollage d'un DCX vers l'Ouest
13:56 à 14:00 Cloches de l'église
14:32 Décollage d'un avion léger vers l'Est
14:47 à 14.50 Cloches de l'église
14:50 Passage d'un Jet de l'armée
16:02 Passage d'un hydravion léger - Sud-Nord
16:15 Passage d'un hydravion léger - Nord-Sud
16:35 Décollage d'un avion DCX
16:37 Klaxon de train
17:13 Décollage d'un avion DCX vers l'Ouest
17:46 Décollage d'un avion DCX vers l'Ouest
18:00 à 18:03 Cloches de l'église et décollage d'un avion DCX
vers l'Ouest
18:06 Passage d'un avion léger - Ouest-Est
18:12 Décollage d'un avion DCX vers l'Ouest
19:12 Décollage d'un avion léger vers l'Est
Fin à 19:31

Enregistrement # 2

L'enregistrement a été pris devant le 1528 de la rue Jandomien.

(voir carte à la page 26)

Résultats obtenus

Le graphique à la page 21 illustre l'importance des crêtes sonores produites par le passage des avions. Toutefois, les niveaux de crêtes enregistrés au point d'échantillonnage # 2 sont moins importants que ceux au # 1. Cette différence est due au plus grand éloignement du point # 2 de l'aéroport.

$$L_{\text{Max}} \text{ moyen (\# 1)} = 79 \text{ dB (A)}$$

$$L_{\text{Max}} \text{ moyen (\# 2)} = 73 \text{ dB (A)}$$

$$\Delta L_{\text{Max}} \text{ moyen} = 6 \text{ dB (A)}$$

(cette différence est significative)

Le niveau L_{Moy} du # 2 varie plus fortement que celui du # 1, soit de 43.11 @ 52.88 dB (A) pour le # 2, et 50.84 @ 55.57 dB (A) pour le # 1.

Pour sa part, le bruit de fond (L_{95}) est caractéristique d'une zone résidentielle calme (Variation entre 40 et 49 dB (A)).

Discussion: Le climat sonore au point # 2 est plus calme que celui au # 1. De plus, celui-ci (# 2) est plus représentatif de l'ensemble du corridor à l'étude.

$$L_{\text{Max}} \text{ moyen (\# 1)} - L_{\text{Max}} \text{ moyen (\# 2)} \approx 6 \text{ dB (A)}$$

$$L_{95} \text{ moyen (\# 1)} - L_{95} \text{ moyen (\# 2)} \approx 4 \text{ dB (A)}$$

$$L_{\text{Moy}} \text{ moyen (\# 1)} - L_{\text{Moy}} \text{ moyen (\# 2)} \approx 5 \text{ dB (A)}$$

Conclusions:

La mise en service de la future autoroute risque de perturber fortement le climat sonore du corridor d'étude, si des mesures correctives appropriées ne sont pas utilisées pour réduire l'importance de cet impact.

ENREGISTREMENT # 2

DATE: 1978-03-30

LIEU: A-40, ANCIENNE-LORETTE, 1528 rue Jandomien

PERIODE: 08:00 h @ 20:05 h

	P E R I O D E														
	08:00 08:30	08:30 09:00	09:00 09:30	09:30 10:00	10:00 10:30	10:30 11:00	11:00 11:30	11:30 12:00	12:00 12:30	12:30 13:00	13:00 13:30	13:30 14:00	14:00 14:30	14:30 15:00	15:00 15:30
L _{max}	75	96	77	66	67	64	62	82	67	69	67	68	67	75	65
L _{eq}	55.13	69.50	52.61	50.38	53.94	53.39	50.06	58.87	47.56	50.41	54.50	52.95	53.58	54.12	48.93
L _{moy}	52.88	47.72	48.58	48.71	51.72	52.58	48.48	48.12	44.69	48.62	51.97	51.48	51.27	50.08	46.88
G	3.25	5.87	4.14	3.42	4.29	2.58	3.27	6.16	3.61	3.54	4.18	3.22	4.12	4.29	3.31
L ₁	62	69	63	58	63	59	60	72	57	57	65	60	63	66	59
L ₁₀	56	54	54	53	57	56	53	56	49	54	57	56	57	55	51
L ₅₀	53	46	48	49	52	53	48	47	44	48	51	51	51	49	46
L ₉₅	48	42	43	43	44	49	44	42	40	43	46	47	45	45	43

ENREGISTREMENT # 2

DATE: 1978-03-30

LIEU: A-40, ANCIENNE-LORETTE, 1528 rue Jandomien

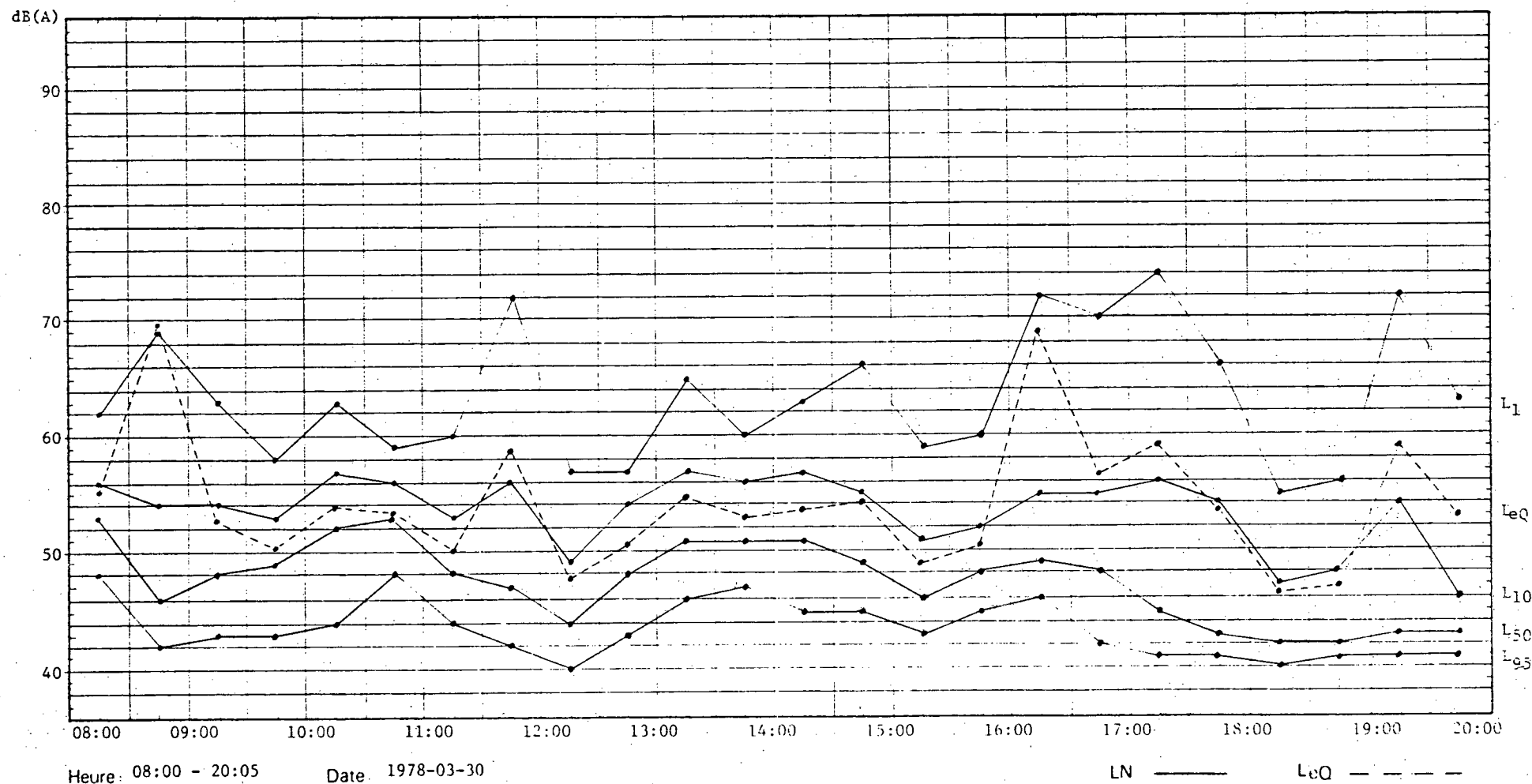
PERIODE: 08:00 h @ 20:05 h

	P E R I O D E														
	15:30 16:00	16:00 16:30	16:30 17:00	17:00 17:30	17:30 18:00	18:00 18:30	18:30 19:00	19:00 19:30	19:30 20:00						
L _{max}	67	95	79	80	73	70	69	84	78						
L _{eQ}	50:35	68.89	56.51	59.18	53.32	46.29	46.92	59.03	52.79						
L _{moy}	48.69	50.44	48.91	47.44	45.65	43.11	43.41	45.38	43.60						
σ	2.96	5.08	5.57	6.85	5.65	3.18	3.49	6.45	3.81						
L ₁	60	72	70	74	66	55	56	72	63						
L ₁₀	52	55	55	56	54	47	48	54	46						
L ₅₀	48	49	48	45	43	42	42	43	43						
L ₉₅	45	46	42	41	41	40	41	41	41						

ENREGISTREMENT # 2

COMPOTEMENT DES NIVEAUX L_T , L_{10} , L_{50} , L_{95} & L_{eq}

LIEU: A-40, ANCIENNE-LORETTE, 1528 rue Jandomien



ENREGISTREMENT # 2Commentaires:

Le climat sonore de cette zone est perturbé par un chantier de construction domiciliaire en bordure opposée de l'Autoroute 40. Cette perturbation s'applique pour les périodes de 08:00 @ 12:00 heures.

La pointe sonore de 11:30 @ 12:00 heures est due à la conjugaison des cloches de l'église et du hurlement d'un chien voisin de l'appareil.

Celle de 16:00 @ 16:30 heures est due au passage d'un jet de l'armée.

Il est de plus à noter que malgré l'éloignement de l'aéroport, les niveaux L_1 et L_{10} et L_{eq} sont affectés par les arrivées et les décollages d'avions, tel que mentionné aux commentaires de l'enregistrement # 1.

Gilles Fontaine

Gilles Fontaine, tech.

Division des Etudes de l'Environnement

1978-03-30

ENREGISTREMENT # 2

1978 - 03 - 30

ANCIENNE LORETTE

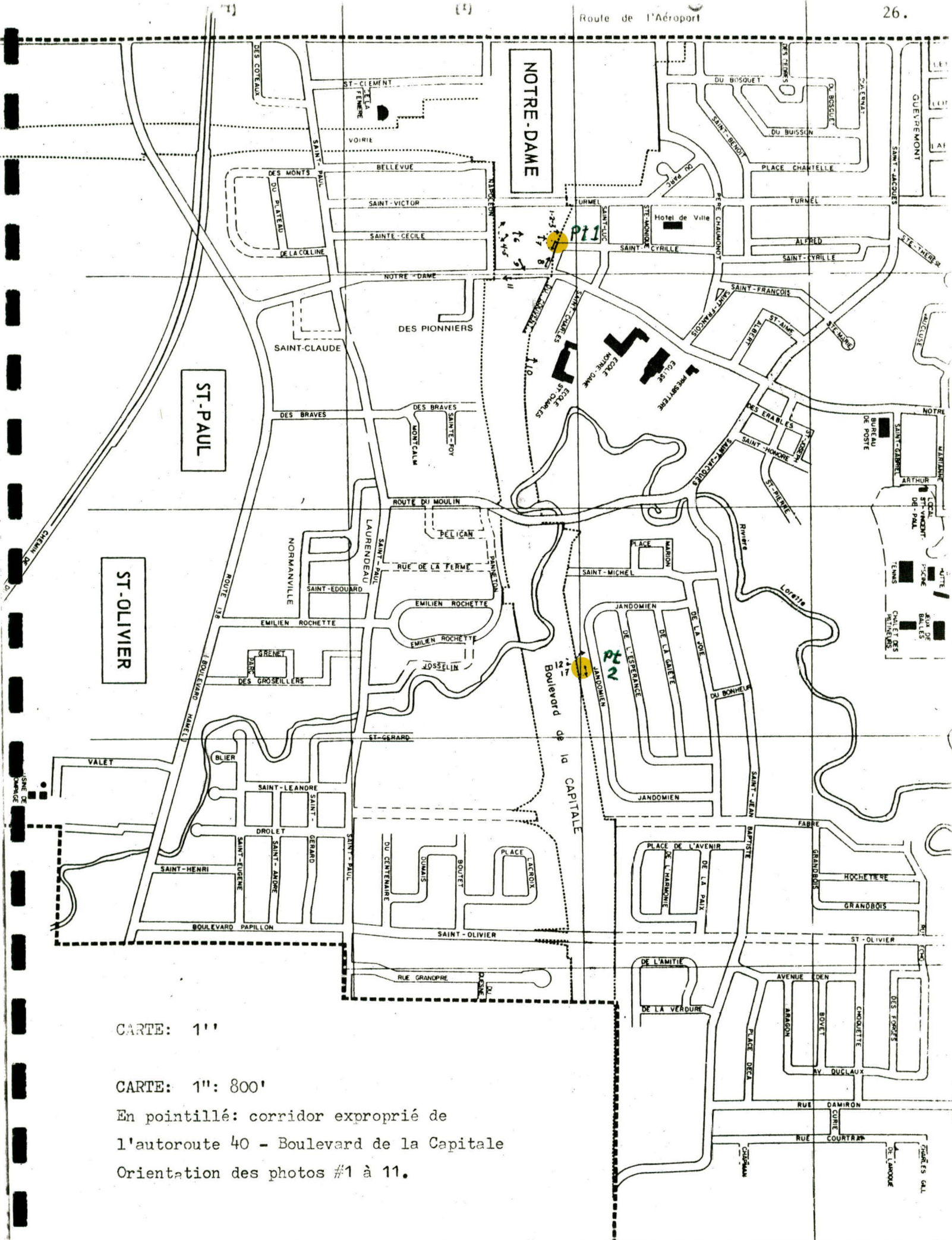
8:00	Départ de l'appareil
9:00	Aboiement de chien à proximité de l'appareil
11:45	Aboiement de chien à proximité de l'appareil
11:48 @ 11:51	Cloches de l'église et hurlement de chien
12:05 @ 12:25	Enfants qui jouent devant la maison, en attendant l'autobus
14:00	Camion de vidanges
14:40 @ 14:43	Travail d'un souffleur à neige
16:03	Passage d'un Jet de l'armée (ouest - est)
20:05	Arrêt de l'appareil

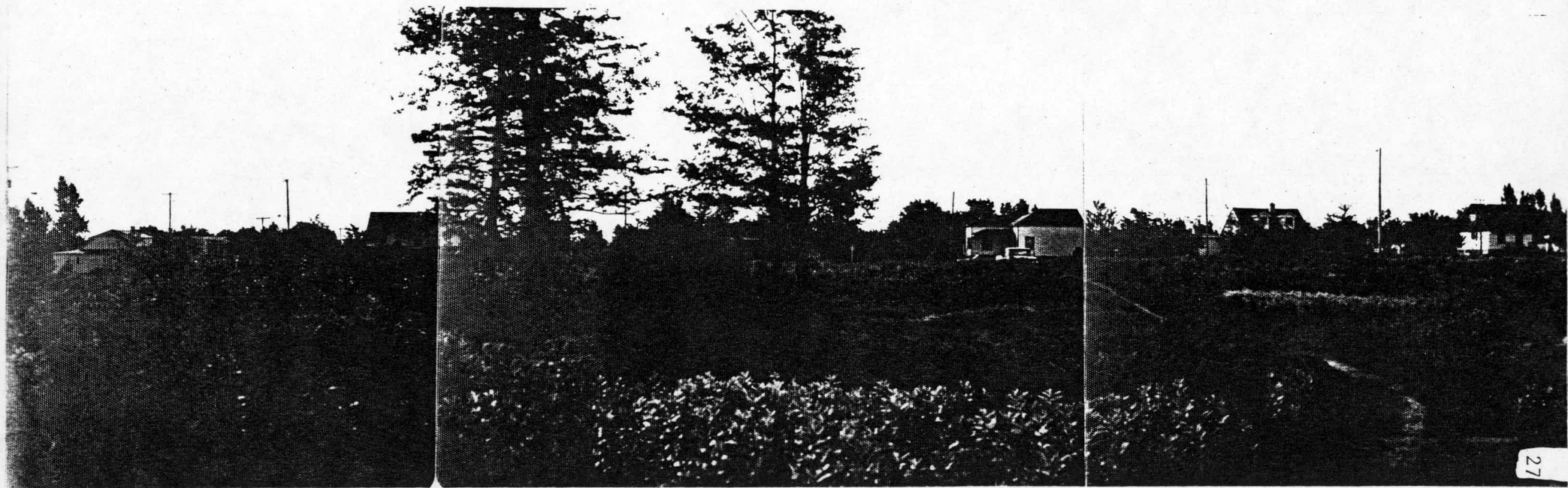
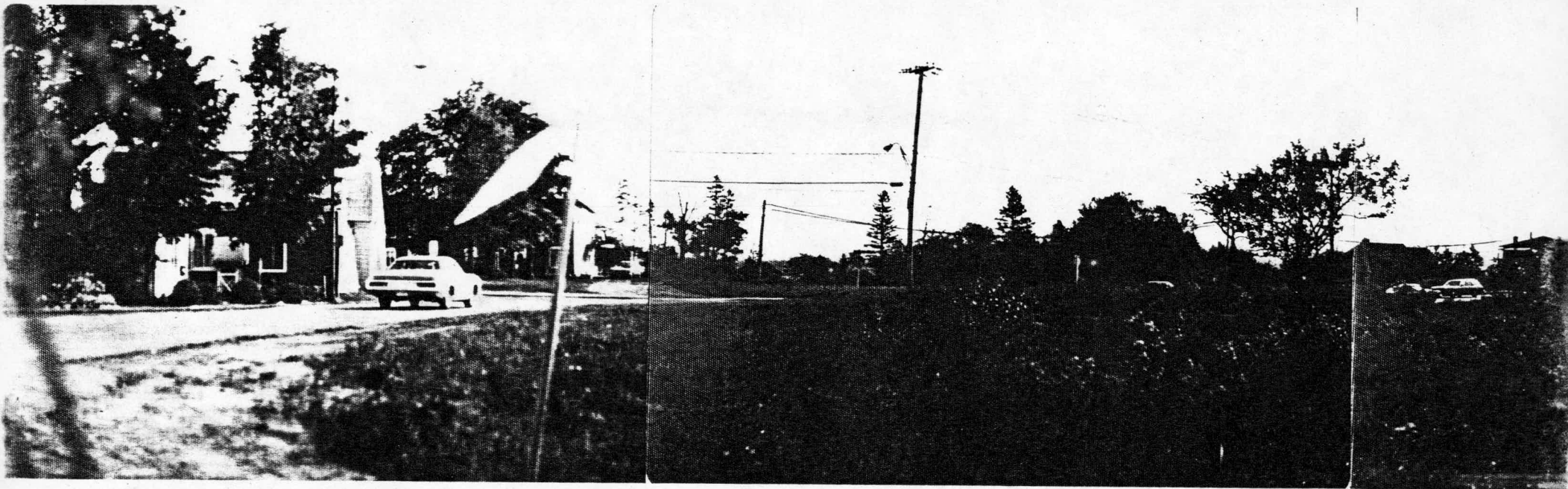
ANNEXE I

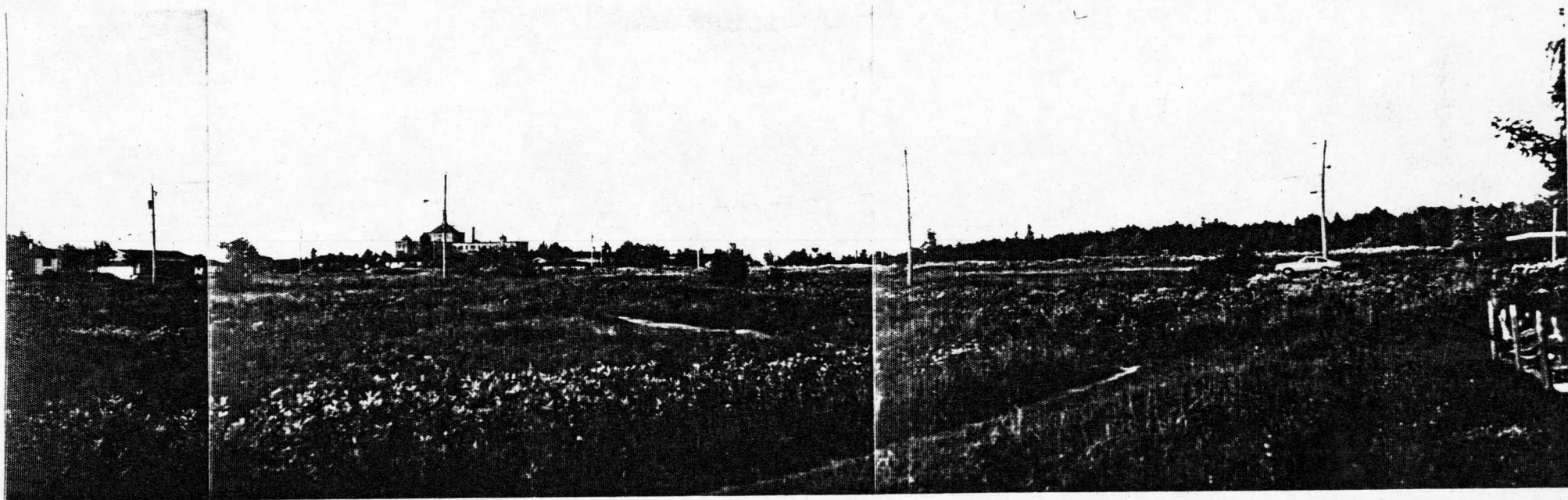


Localisation du corridor de l'autorout

- Rouge: corridor étudié

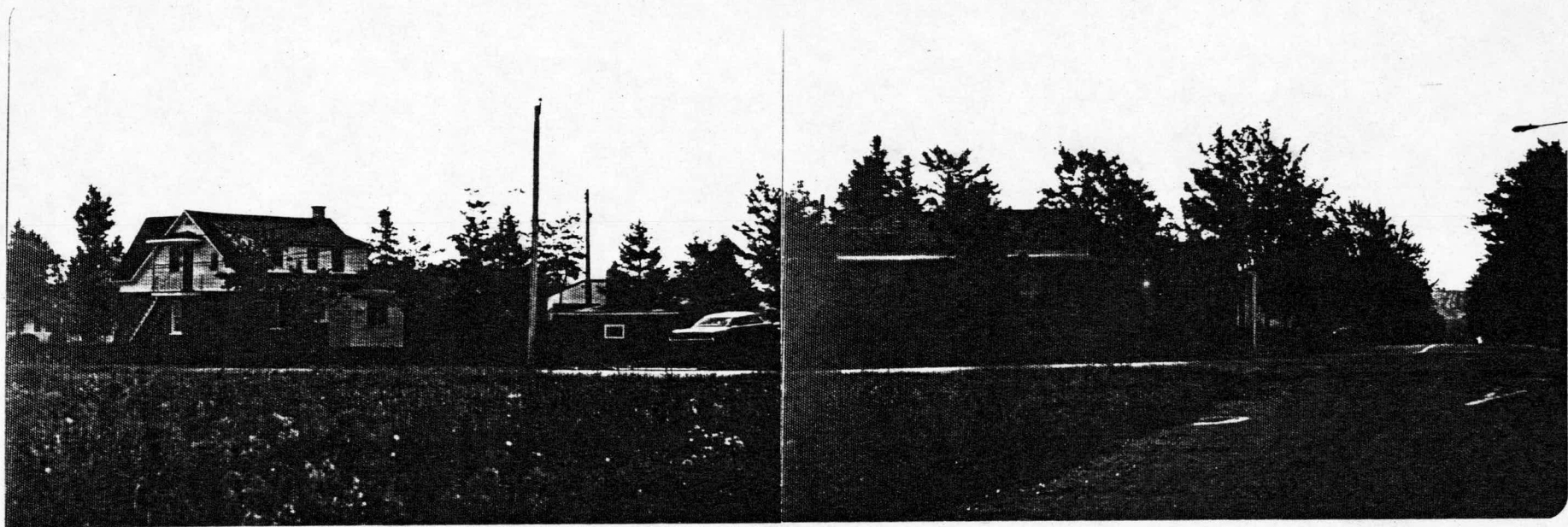




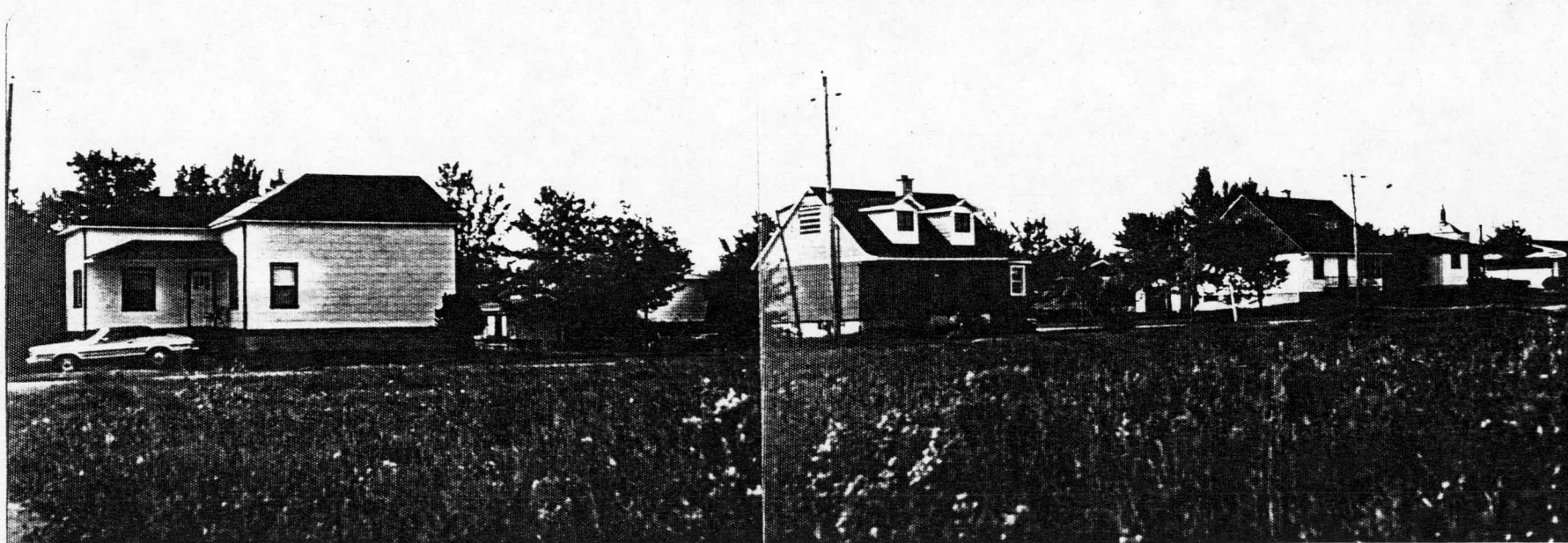


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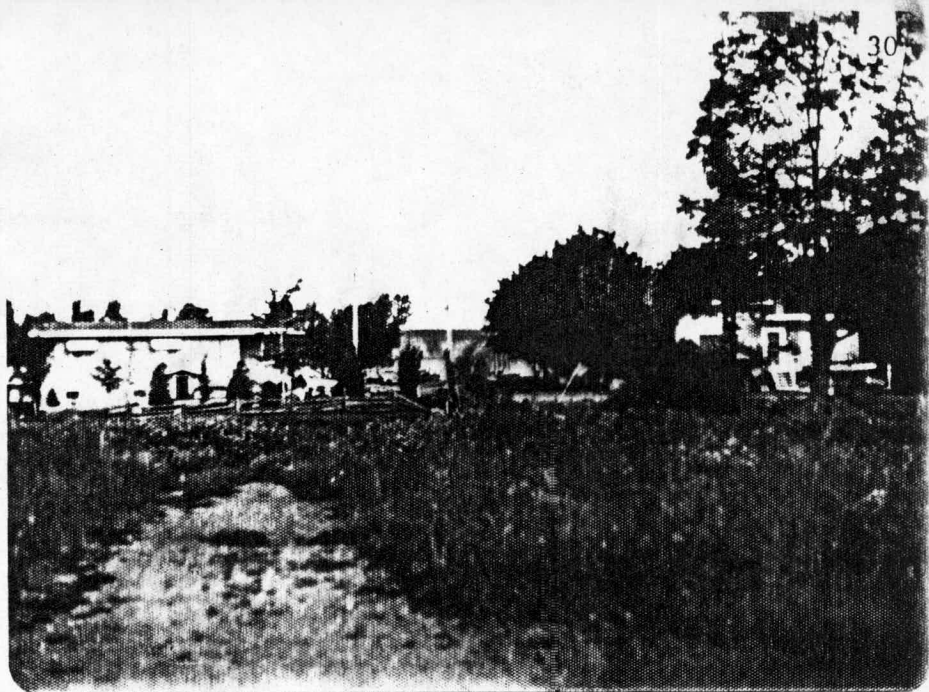
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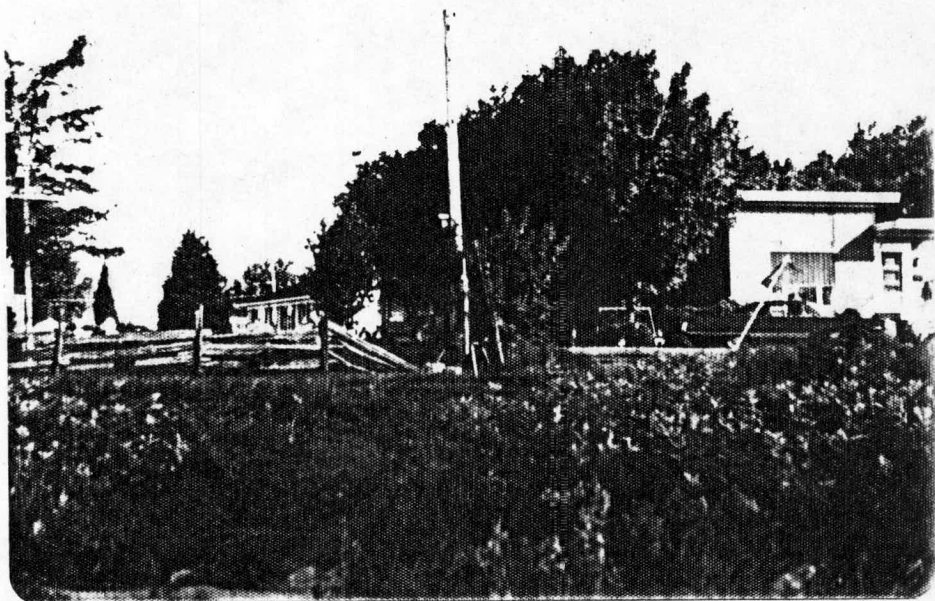
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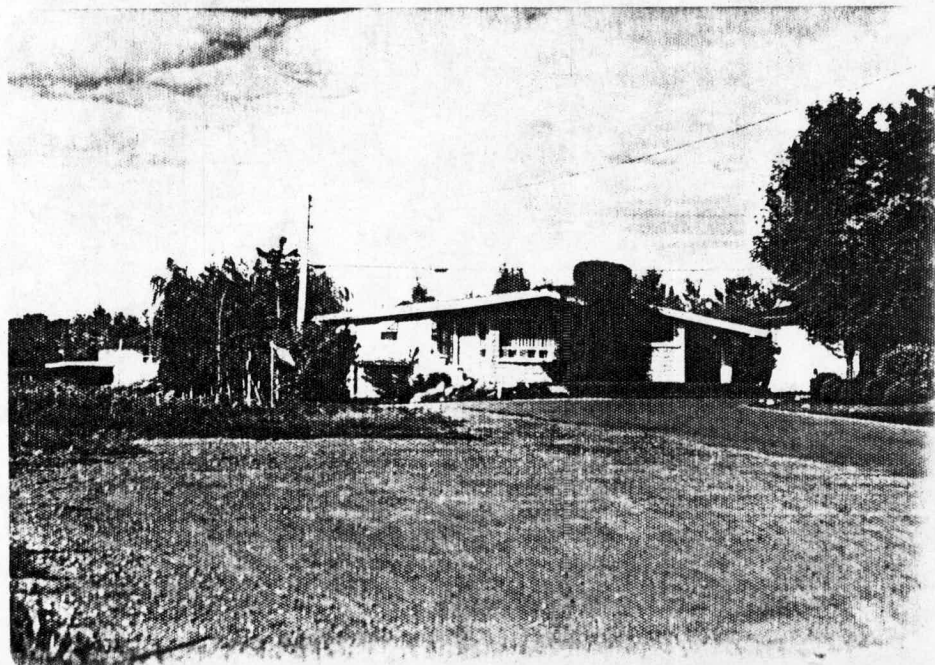
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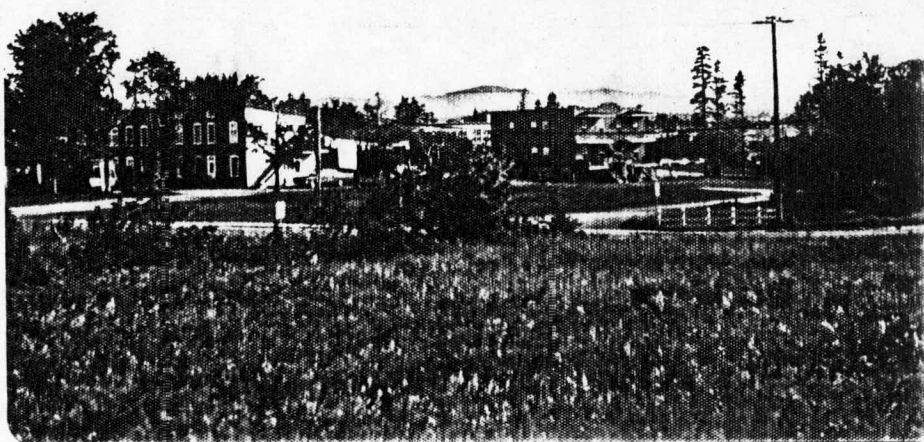
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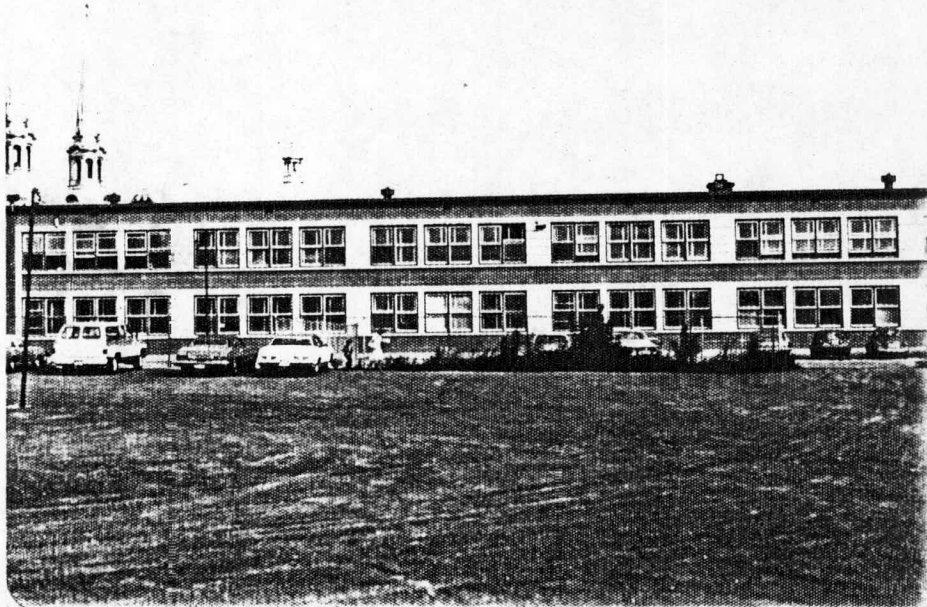
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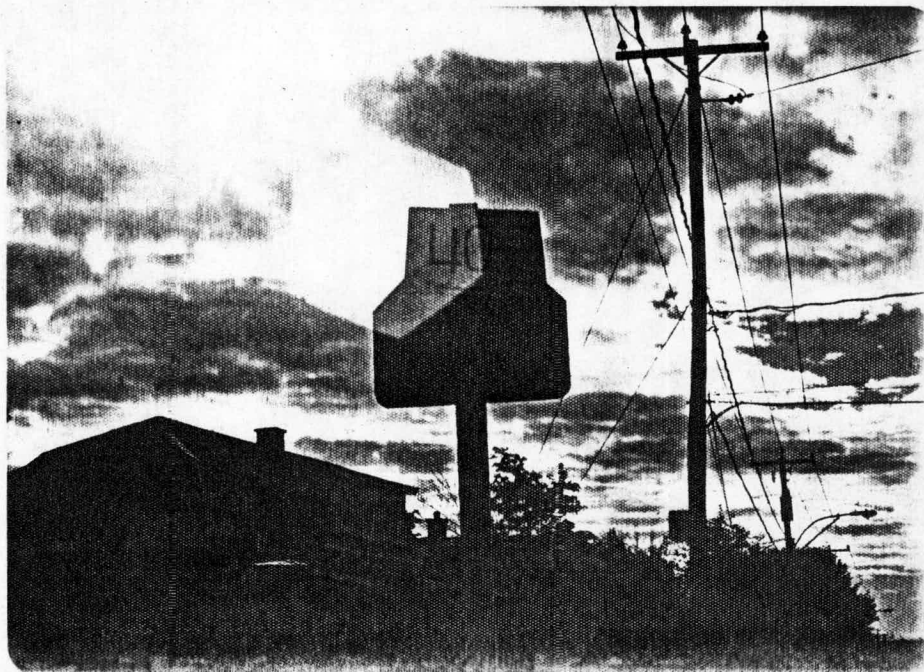
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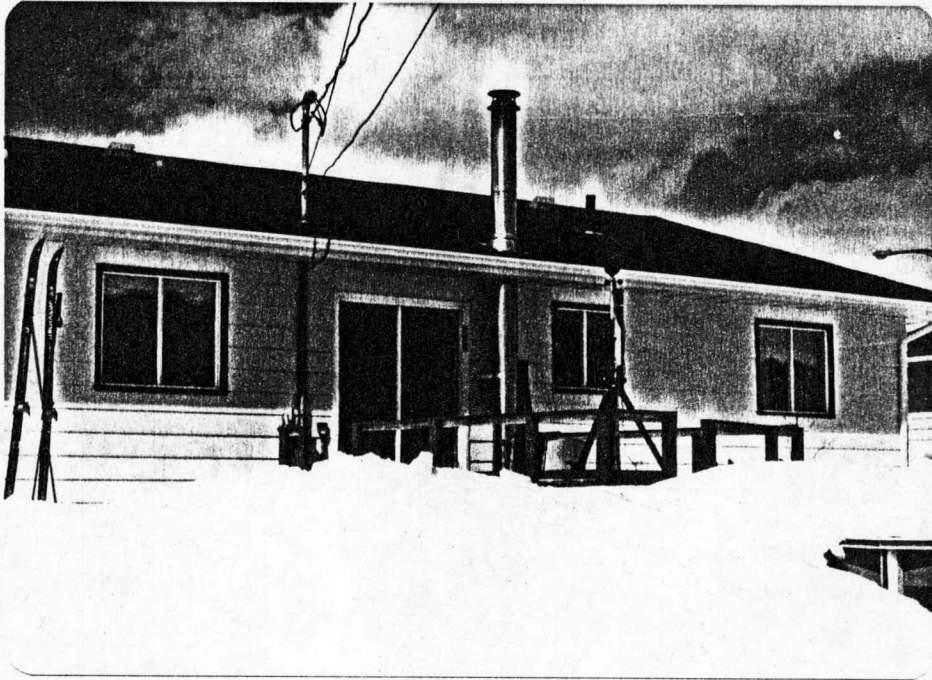
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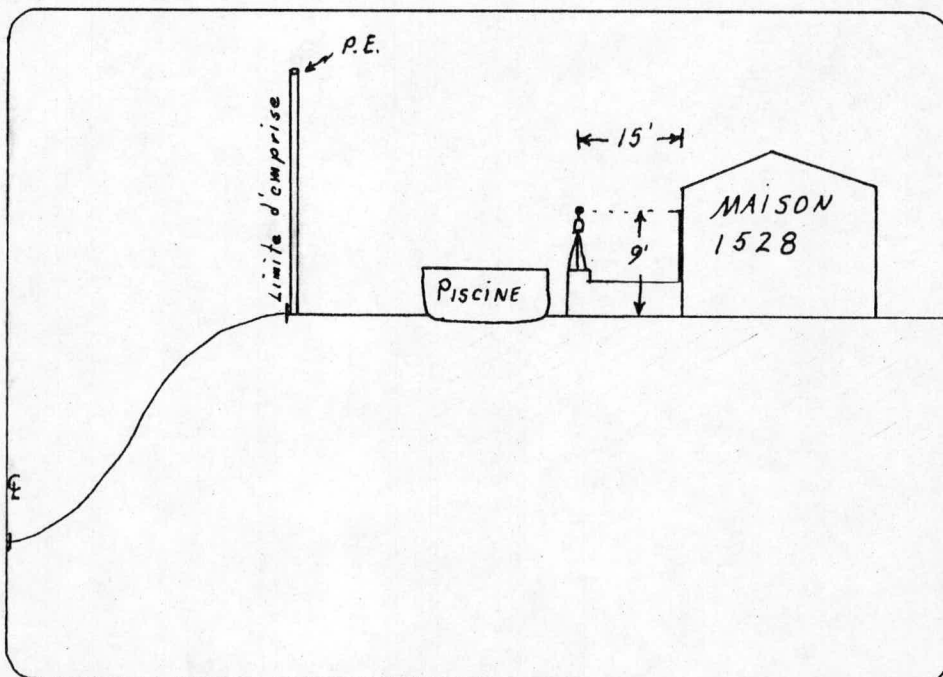
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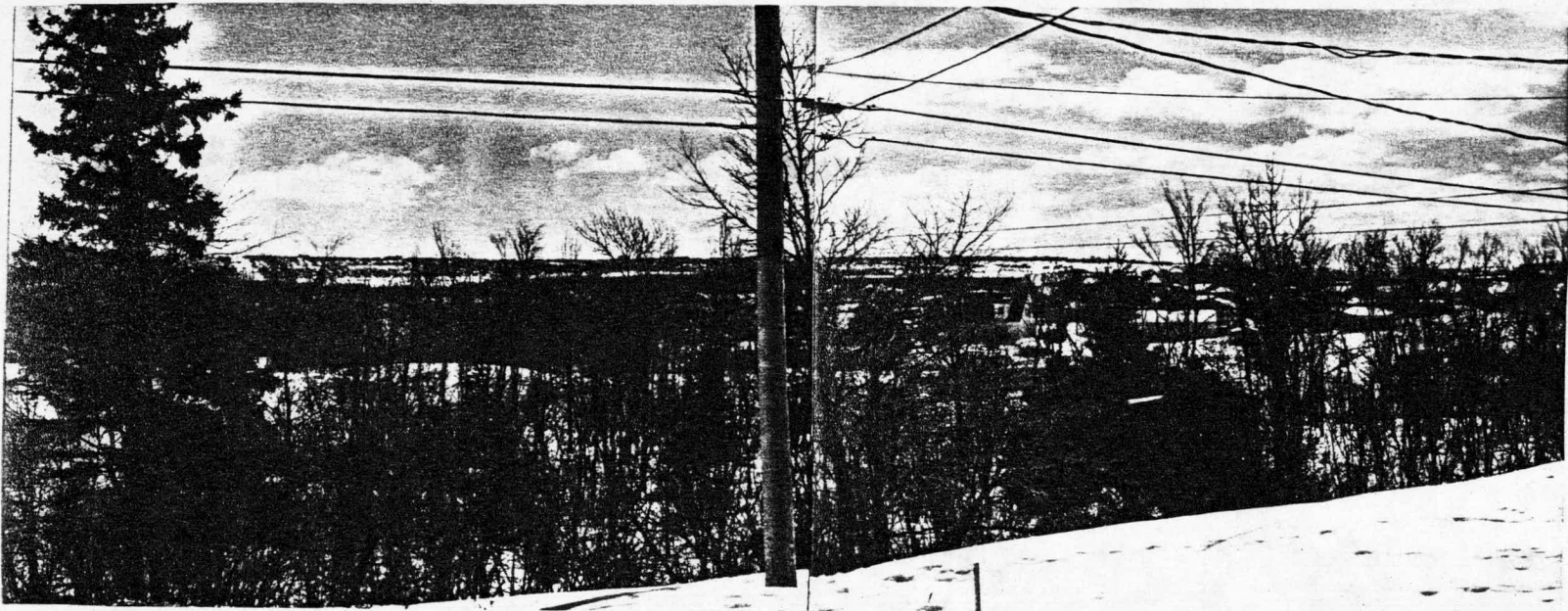


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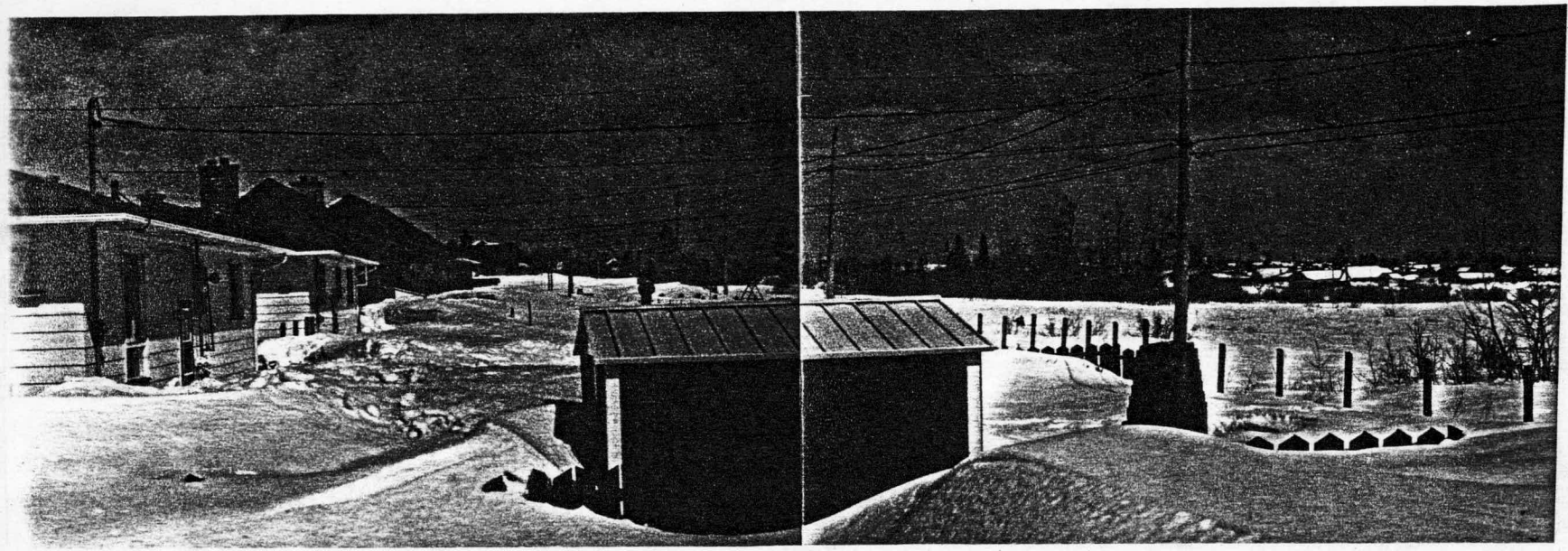


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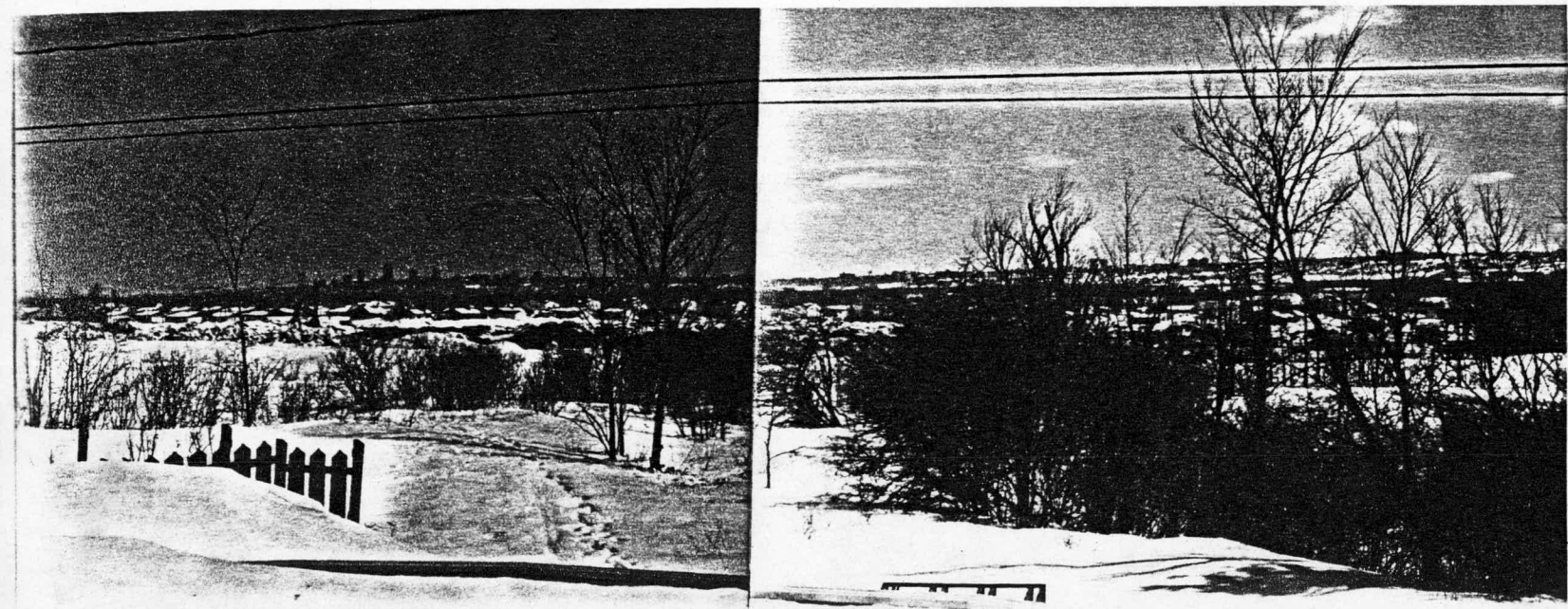


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ANNEXE 2



U. S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

FEDERAL-AID HIGHWAY PROGRAM MANUAL

VOLUME	7	RIGHT-OF-WAY AND ENVIRONMENT
CHAPTER	7	ENVIRONMENT
SECTION	3	PROCEDURES FOR ABATEMENT OF HIGHWAY TRAFFIC NOISE AND CONSTRUCTION NOISE

Transmittal 192
May 14, 1976
HEV-21

- Par. 1. Purpose
2. Authority
3. Noise Standards
4. Definitions
5. Retroactivity
6. Applicability
7. Analysis of Traffic Noise Impacts and Abatement Measures
8. Design Noise Levels
9. Procedure for Requesting Exceptions to the Achievement of the Design Noise Levels for Type IA Highway Projects
10. Policies for Coordination With Local Officials
11. Noise Abatement Measures for Lands Which Are Undeveloped on the Date of Public Knowledge of the Proposed Highway Project
12. Federal Participation
13. Construction Noise
14. Traffic Noise Prediction Methods

1. PURPOSE

* To promulgate:

- a. *policies and procedures for noise studies and noise abatement measures,*
- b. *design noise levels, and*
- c. *requirements for coordination with local officials for use in the planning and design of highways approved pursuant to Title 23, United States Code.*

2. AUTHORITY

23 U.S.C. 109(h), 109(i), and 42 U.S.C. 4331, 4332.

*Regulatory material is italicized.

3. NOISE STANDARDS

The highway traffic noise studies, noise abatement procedures, coordination requirements, and design noise levels in this directive constitute the noise standards mandated by 23 U.S.C. 109(i). All highway projects which are developed in conformance with this directive shall be deemed in conformance with the FHWA noise standards.

4. DEFINITIONS (as used in this directive)

- a. Buffer Zone - lands, properties, and parcels (or portions thereof) adjacent to a highway acquired either in fee or a lesser interest for the purpose of preempting development which would be adversely impacted by traffic noise and for other noise abatement purposes.
- b. Control of Access - the condition where the right of owners or occupants of abutting land or other persons to access, light, air, or view in connection with a highway is fully or partially controlled by public authority.
 - (1) Full control of access means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and by prohibiting crossings at grade or direct private driveway connections.
 - (2) Partial control of access means that the authority to control access is exercised to give preference to through traffic except that, in addition to access connections with selected public roads, there may be some crossings at grade and some private driveway connections.
 - (3) Uncontrolled access means that the authority having jurisdiction over a highway, street, or road does not limit the number of points of ingress or egress except through the exercise of control over the placement and the geometrics of connections as necessary for the safety of the traveling public.
- c. Date of Public Knowledge of a Proposed Highway Project - the date that the highway agency officially notifies the public of the adoption of the location of a proposed highway project.

- d. Design Noise Levels - the noise levels established by this directive for various activities or land uses which represent the upper limit of acceptable traffic noise level conditions. These levels are used to determine the degree of impact of traffic noise on human activities.
- e. Design Year - the future year used to estimate the probable traffic volume for which a highway is designed. A time 10 to 20 years from the start of construction is usually used. ←
- f. Existing Noise Levels - the noise, made up of all the natural and manmade noises, considered to be usually present (unique noise events may be excluded) within a particular area's acoustical environment.
- g. Highway Section - a finite length of highway proposed for development between logical termini (population centers, major traffic generators, major crossroads, etc.) as normally included in a location study or multiyear highway improvement program.
- h. L_{10} - the sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration. This value is an indicator of both the magnitude and frequency of occurrence of the loudest noise events.
- i. $L_{10}(h)$ - the hourly value of L_{10} .
- j. L_{90} - the sound level that is exceeded 90 percent of the time (the 10th percentile) for the period under consideration.
- k. L_{eq} - the equivalent steady state sound level which in a stated period of time would contain the same acoustic energy as the time-varying sound level during the same time period.
- l. $L_{eq}(h)$ - the hourly value of L_{eq} .
- m. Level of Service C - traffic conditions (used and described in the Highway Capacity Manual - Highway Research Board, Special Report 87, 1965) where speed and maneuverability are closely controlled by high volumes, and where drivers are restricted in their freedom to select speed, change lanes, or pass.

- n. Location Approval - the approval which establishes the general location for a highway section based upon a location study report (in accordance with FHPM 7-7-5) or the adoption of a final environmental impact statement or negative declaration (where the highway agency has implemented paragraph 11b(7) and (8) of the Process Guidelines--FHPM 7-7-1).
- o. Metropolitan Planning Organization - the organization, designated by the Governor, as being responsible, together with the State, for carrying out the provisions of 23 U.S.C. 134, as required by 23 U.S.C. 104(f)(3), and capable of meeting the requirements of 49 U.S.C. 1603(a).
- p. Noise Level - the sound level obtained through use of A-weighting characteristics specified by the American National Standards Institute (ANSI) Standard S1.4-1971. The unit of measure is the decibel (dB), commonly referred to as dBA when A-weighting is used.
- q. Noise Standards - the highway traffic noise studies, noise abatement procedures, coordination requirements, and design noise levels in this directive.
- r. Operating Speed - the highest overall speed at which a driver can travel on a given highway under favorable weather conditions and under prevailing traffic conditions, without at any time exceeding the safe speed as determined by the design speed on a section-by-section basis.
- s. Partial Noise Abatement Measures - measures taken to reduce the noise impact but not to a level below the design noise levels.
- t. Project Development - actions described in State action plans developed pursuant to FHPM 7-7-1 (Process Guidelines), and specific studies, surveys, coordination, reviews, approvals, and other activities and steps normally engaged in to determine the location, to perform the design, and to prepare the plans, specifications and estimates for a highway project.
- u. Traffic Noise Impacts - impacts which occur when the predicted traffic noise levels approach or exceed the design noise levels, or when the predicted traffic noise levels substantially exceed the existing noise levels.
- v. Truck - any motor vehicle (including buses) having a gross vehicle weight greater than 10,000 pounds.

- w. Type IA Project - a proposed Federal or Federal-aid highway project for construction or reconstruction of a section of highway (or portion thereof) which has either partial or full control of access and for which the highway location is approved after July 1, 1972, or the authorization to advertise for bids for the major grade and drain elements is given after July 1, 1976. Projects unrelated to traffic noise such as lighting, signing, landscaping, safety, etc., are not considered construction or reconstruction of a highway section.
- x. Type IB Project - a proposed Federal or Federal-aid highway project for construction or reconstruction of a section of highway (or portion thereof) on which the access is uncontrolled and for which the highway location is approved after July 1, 1972, or authorization to advertise for bids for the major grade and drain elements is given after July 1, 1976.
- y. Type II Project - a proposed Federal or Federal-aid highway project for noise abatement on an existing highway (located on a Federal-aid system) which does not include construction or reconstruction of a highway section (or portion thereof).
- z. Undeveloped Lands - those tracts of land or portions thereof which do not contain improvements or activities devoted to frequent human habitation or use (including low density recreational use), and for which such improvements or activities are unplanned and not programed.

5. RETROACTIVITY

The requirements of this directive are not retroactive. Approval actions taken prior to the effective date of this directive, in conformance with Policy and Procedure Memorandums 90-2 dated April 26, 1972, subject: Interim Noise Standards and Procedures for Implementing Section 109(i) Title 23, U.S.C., and February 8, 1973, Subject: Noise Standards and Procedures; and FHPM 7-7-3-1 dated February 20, 1974, shall remain in effect.

6. APPLICABILITY

- a. Type IA Projects (Partial and full control of access) - all requirements of this directive (FHPM 7-7-3) apply to all Type IA projects unless it is specifically indicated that a paragraph applies only to Type II projects.

- b. *Type IB Projects (Uncontrolled access) - all requirements of this directive (FHPM 7-7-3), with the exception of paragraphs 7b(6) and 9, apply to all IB projects unless it is specifically indicated that a paragraph applies only to Type II projects.*
- c. *Type II Projects (Specifically for noise abatement) - the development and implementation of Type II projects are not mandatory requirements of 23 U.S.C. 109(i) and are therefore not requirements of this directive. When Type II projects are proposed for Federal-aid highway fund participation (at the option of the highway agency) the provisions of paragraphs 7d, e, 12a, c, d, e, and 13 of this directive shall apply.*
- d. *Type IA, IB, and II Projects - the plans and specifications for Type IA, IB, and II projects shall not be approved by FHWA unless:*
 - (1) *the noise study report has been concurred in by FHWA, and*
 - (2) *the project has been developed in accordance with the requirements of this directive.*
- e. *Type IA Projects - in addition to the requirements of paragraph 6d, the plans and specifications for Type IA projects shall not be approved by FHWA unless:*
 - (1) *noise abatement measures are incorporated to attain reductions to or below the design noise levels for those activities and land uses where predicted noise levels exceed the design noise levels in Figure 3-1, or*
 - (2) *partial noise abatement measures are incorporated, where feasible, and exceptions to the design noise levels have been approved by FHWA where the design noise levels cannot be reasonably achieved.*
- f. *Type IB Projects - in addition to the requirements of paragraph 6d, the plans and specifications for Type IB projects shall not be approved by FHWA unless the noise abatement measures identified as feasible (as determined by the analysis in paragraph 7b(5)) have been incorporated in the plans and specifications for Type IB projects.*

7. ANALYSIS OF TRAFFIC NOISE IMPACTS AND ABATEMENT MEASURES

- a. In type IA and IB project development, the highway agency shall determine and analyze expected traffic noise impacts and determine the overall benefits which can be achieved by noise abatement measures to mitigate these impacts, giving weight to any adverse social, economic, and environmental effects. The level of analysis may vary from simple calculations for rural and low volume highways to extensive analysis for high volume controlled access highways in urban areas.
- b. The traffic noise analysis shall be conducted in the following manner:
 - (1) Identify existing activities or land uses which may be affected by noise from the highway section.
 - (2) Predict the traffic noise levels for each alternative under detailed study (including the "do nothing" alternative). Steps 3 through 6 of the traffic noise analysis may be eliminated if it is analytically determined (in accordance with steps 1 and 2) that activities or developed land uses are not sufficiently close to the proposed highway improvement to be adversely affected by traffic noise.
 - (3) Measure the existing noise levels for existing activities or developed land uses. Measurements may not be necessary where it is clear that the existing levels are predominantly from the highway being improved and can be satisfactorily estimated using approved noise prediction methods. The purpose of this noise level information is to quantify the existing acoustic environment and to provide a base for assessing the impact of noise level increases. The descriptors (L_{eq} or L_{10}) used to quantify these measurements shall be consistent with the descriptors used for the predicted levels and the design noise levels in Figure 3-1. Measurement systems shall, as a minimum, meet the requirements for Type 2 instruments as specified in ANSI Standard S1.4-1971.

- (4) Compare the predicted traffic noise levels for each alternative under detailed study with the existing noise levels and with the design noise levels in Figure 3-1. This comparison shall also include predicted traffic noise levels for the "do nothing" alternative in the design year. Such information shall be used primarily to describe the noise impact of proposed highway improvements in contrast with noise levels likely to be reached in the same area if no highway improvement is undertaken. Noise impacts can be expected when the predicted traffic noise levels (for the design year) approach or exceed the design noise levels in Figure 3-1, or when the predicted traffic noise levels are substantially higher than the existing noise levels. The comparison between predicted traffic noise levels for the proposed action and the "do nothing" alternative (for the design year) may be used in the consideration of exceptions to the design noise levels.

- IMP. (5) Examine and evaluate alternative noise abatement measures for reducing or eliminating the noise impact on existing activities; developed lands; and undeveloped lands for which development is planned, designed and programmed. This examination shall include a thorough consideration of traffic management measures (e.g., prohibition of certain vehicle types, time use restrictions for certain vehicle types, modified speed limits, exclusive lane designations, traffic control devices or combinations of such measures). Federal law requires a determination that noise abatement measures needed to implement the noise standards have been incorporated into project plans and specifications before they are approved. Because decisions on noise abatement are prerequisites to determining environmental impacts, and because these impacts influence decisions on adoption of a highway location, it is important that a preliminary determination be made. Before adoption of a highway location, the highway agency shall identify:

- (a) noise abatement measures which are likely to be incorporated in the project, and
- (b) noise impacts for which no apparent solution is available.

- (6) Identify for Type IA projects those lengths of highway (separately for each side of the highway) and those individual land uses where noise abatement measures appear impracticable or not prudent and which may qualify under the exception procedures (paragraph 9a and b).
- c. Upon completion of the noise analysis for Type IA or IB projects, the highway agency shall prepare a noise study report for FHWA concurrence.
- (1) The noise study report shall include the following:
- (a) detailed noise analysis and evaluation information (paragraph 7b),
 - (b) proposed noise abatement measures including descriptive information which portrays their design details, anticipated effectiveness in relation to the design noise levels (paragraph 8) and/or existing noise levels and estimated costs and benefits,
 - (c) requests for exceptions to the design noise levels and supporting information as required and outlined in paragraph 9 (Type IA projects only),
 - (d) discussion of construction noise analysis information, as required in paragraph 13, including proposed contract provisions to minimize or eliminate adverse construction noise impacts, and
 - (e) discussion and documentation of coordination with local officials as required in paragraph 10.
- (2) The noise study report may be in preparation throughout the project development process but shall be concluded prior to approval of the plans and specifications. Preliminary versions of the report shall be prepared as necessary for environmental statements and for input to decisions on selecting a highway location. Depending on the scope and timeliness of a complete noise report, various sections of the report such as noise impact evaluations, proposed noise abatement measures, noise exception requests, etc., may be processed separately and included in the final report.

- (3) FHWA concurrence in the noise study report shall constitute its approval of all requested exceptions to the design noise levels contained therein and approval of proposed abatement measures contained therein.
- d. Highway agencies proposing to use Federal-aid highway funds for Type II projects shall perform a noise analysis similar to that described in paragraph 7b and shall prepare a noise report with recommendations. This noise report shall indicate and describe the noise impacts that have been identified for these type projects. The design noise levels in Figure 3-1 are a suitable yardstick for this determination.
- e. In requesting Federal construction funding for a Type II project, the highway agency shall indicate the nature of the proposed Type II project and the relative priority with other potential Type II projects in the State. Some of the suggested factors which may be considered in the development of this relative priority are:
- (1) applicable State law,
 - (2) type of development to be protected,
 - (3) magnitude of the traffic noise impact,
 - (4) cost - benefits,
 - (5) population density of the affected area,
 - (6) day-night use of the property,
 - (7) feasibility and practicability of noise abatement at the site,
 - (8) availability of funds,
 - (9) existing noise levels,
 - (10) achievable noise reduction,
 - (11) intrusiveness of highway noise ($L_{10} - L_{90}$),
 - (12) public's attitude,
 - (13) local governments' efforts to control land use adjacent to the highway,
 - (14) date of construction of adjoining development,

- (15) *increase in traffic noise since the development was constructed,*
- (16) *local noise ordinances,*
- (17) *feasibility of abating the noise with traffic control measures.*

8. DESIGN NOISE LEVELS

- a. *The design noise levels in Figure 3-1 represent a balancing of that which may be desirable and that which may be achievable. Consequently, noise impacts can occur even though the design noise levels are achieved. The design noise levels for Categories A, B, C, and E should be viewed as maximum values, recognizing that in many cases, the achievement of lower noise levels would result in even greater benefits to the community. Every reasonable effort shall be taken to achieve substantial noise reductions when predicted noise levels exceed these design noise levels. However, any significant reduction in the existing or predicted noise level will be a benefit, and partial noise abatement measures shall be included in the project development where they are consistent with overall social, economic, and environmental considerations. On the other hand, the adverse social, economic, and environmental effects of providing abatement measures may be too high. For each case where the circumstances warrant, this directive provides for FHWA approval of exceptions to the design noise levels for Type IA projects. Exceptions are not required for Type IB and Type II projects.*
- b. *The design noise levels are to be applied to:*
 - (1) *those undeveloped lands for which development is planned, designed, and programed on the date of public knowledge of the highway project,*
 - (2) *those activities and land uses in existence on the date of public knowledge of the highway project,*
 - (3) *areas which have regular human use and in which a lowered noise level would be of benefit. Such areas would not normally include service stations, junkyards, industrial areas, railroad yards, parking lots, storage*

DESIGN NOISE LEVEL/ACTIVITY RELATIONSHIPS 1/

Activity Category	Design Noise Levels - dBA ^{2/}		Description of Activity Category
	<u>L_{eq}(h)</u>	<u>L₁₀(h)</u>	
A <u>3/</u>	57 (Exterior)	60 (Exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, open spaces, or historic districts which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
12 B <u>3/</u>	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, and parks which are not included in Category A and residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	--	--	For requirements on undeveloped lands see paragraphs 11a and c.
E <u>4/</u>	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

1/ See Paragraph 8 for method of application.

2/ Either L₁₀ or L_{eq} (but not both) design noise levels may be used on a project.

3/ Parks in Categories A and B include all such lands (public or private) which are actually used as parks as well as those public lands officially set aside or designated by a governmental agency as parks on the date of public knowledge of the proposed highway project.

4/ See Paragraphs 8c, d, and e for method of application.

yards, and the unused open space portions of other developments and facilities. Design noise levels should, however, be applied to those parks and recreational areas or portions thereof where serenity and quiet are considered essential even though such areas may not be subject to frequent human use, and

- (4) those places within the sphere of human activity (at approximately ear-level height) where activities actually occur. The values do not apply to an entire tract upon which an activity is based, but only to that portion on which such activity normally occurs.
- c. The interior design noise levels in Category E apply to:
- (1) indoor activities for those parcels where no exterior noise sensitive land use or activity is identified, and
 - (2) those situations where the exterior activities on a tract are either remote from the highway or shielded in some manner so that the exterior activities will not be significantly affected by the noise, but the interior activities will.
- d. The interior design noise levels in Category E may be considered as a basis for noise insulation of public use institutional structures in special situations when, in the judgment of the highway agency and concurred in by the FHWA, such consideration is in the best public interest.
- e. Interior noise level predictions may be computed by subtracting from the predicted exterior levels the noise reduction factors for the building in question. If field measurements of these noise reduction factors are obtained, (or if the factors are calculated from detailed acoustical analyses) the measured (or calculated) values shall be used.
- (1) In the absence of such calculations or field measurements, the noise reduction factors may be obtained from the following table:

<u>Building Type</u>	<u>Window Condition</u>	<u>Noise Reduction Due to Exterior of the Structure</u>
All	Open	10 dB
Light Frame	Ordinary Sash (closed)	20
	Storm Windows	25
Masonry	Single Glazed	25
Masonry	Double Glazed	35

(2) The windows shall be considered open unless there is firm knowledge that the windows are in fact kept closed almost every day of the year.

(3) Situations where open window periods do not coincide with a high traffic noise level may qualify as a closed window condition. In such instances, the optional noise prediction procedures in paragraph 14e shall be used.

9. PROCEDURE FOR REQUESTING EXCEPTIONS TO THE ACHIEVEMENT
OF THE DESIGN NOISE LEVELS FOR TYPE IA HIGHWAY PROJECTS

- a. There may be situations along Type IA highway projects where the predicted noise levels exceed the design noise levels and the adverse social, economic, and environmental effects of noise abatement measures are considered to exceed the abatement benefits. If this condition is expected to occur, the noise analysis shall include evaluations of adverse effects and the benefits of full and partial reductions of the predicted noise levels.
- b. The highway agency may request an exception to the achievement of the specified design noise levels for Type IA projects where it can be demonstrated that the adverse effects exceed the overall benefits. To request an exception, the highway agency shall provide in the noise study report required by paragraph 7c the results of the following:
 - (1) Identification of the individual noise sensitive activities or groups of activities (including the number of persons affected) along the sections of highway which are

subjected to existing traffic noise levels, or are expected to be subjected to future traffic noise levels, in excess of design levels.

- (2) An examination of the overall benefits and adverse effects of partial noise abatement measures.*
 - (3) A weighing of the overall benefits which can be achieved by the noise abatement measures against any adverse effects and other conflicting values such as economic reasonableness, air quality, highway safety, adjacent neighborhood desires about esthetic impact (and other desires), or other similar values. Such weighing shall establish that measures for reduction of noise levels to more desirable levels for that particular activity, land use, or groups of activities are not in the best overall public interest. A principal factor in this weighing shall be the concern for public health, public welfare, and the quality of life. These decisions must ultimately be based upon case-by-case determinations. However, every effort shall be made to obtain detailed information on the costs, benefits, and effects involved to assure that final decisions utilize a systematic and factually based assessment.*
 - (4) Recommendations for incorporation in the project plans and specifications of the partial noise abatement measures determined to have benefits consistent with adverse effects.*
- c. Exception approvals shall not be granted without a showing that all reasonable options for noise reduction (excluding measures provided by paragraph 12e) have been explored and that the partial noise abatement measures recommended provide the greatest attainable noise reductions consistent with the overall public interest.*
- d. In most cases, exceptions will be approved when the predicted traffic noise level from the highway project is less than the existing noise level (originating from sources other than the highway being improved or replaced) for the activity or land use in question. In these instances, there should be a reasonable expectation that the noise from the other sources will not be significantly reduced in the future.*

10. POLICIES FOR COORDINATION WITH LOCAL OFFICIALS

Pursuant to this directive, FHPM 7-7-1 (Process Guidelines), and FHPM 7-7-5 (Public Hearing and Location/Design Approval) highway agencies have the responsibility for taking measures that are prudent and feasible to assure that the location and design of highways are compatible with existing and planned land uses. Local governments have responsibility for land development control and zoning. Highway agencies can be of considerable assistance to local officials in promoting compatibility between land development and highways. Therefore, for each Type IA and IB project, highway agencies shall cooperate with metropolitan planning organizations and with local officials (within whose jurisdiction the highway project is located) by furnishing:

- a. approximate generalized future noise levels (for various distances from the highway improvement) for both developed and undeveloped lands or properties in the immediate vicinity of the project,
- b. information that may be useful to local communities to protect future land development from becoming incompatible with anticipated highway noise levels, and
- c. the FHWA policy regarding land use development or changes which are initiated after issuance of this directive (as described in paragraph 12c(2)).

11. NOISE ABATEMENT MEASURES FOR LANDS WHICH ARE UNDEVELOPED ON THE DATE OF PUBLIC KNOWLEDGE OF THE PROPOSED HIGHWAY PROJECT

- a. Noise abatement measures are not required for lands which are undeveloped on the date of public knowledge of the proposed highway project (except as provided in paragraph 11b).
- b. For lands which are undeveloped on the date of public knowledge of the highway project, the highway agency should treat the activity or land use as developed land in the following situations:
 - (1) the development was planned, designed, and programed before the highway studies and there is firm evidence that the development has been only temporarily delayed, or

- (2) the development is planned, designed, and programed during the highway project planning and design; there is a very high probability of the development being constructed; and the developer has considered the noise impacts to the extent reasonable and practicable.
- c. A highway agency may request Federal-aid participation in the cost of providing noise abatement measures for undeveloped lands along Type IA and IB projects when the noise analysis demonstrates a need in the following situations:
- (1) development occurs between the date of public knowledge of the proposed highway project and the actual construction of the project, or
 - (2) the probability of development occurring within a few years is very high and a strong case can be made in favor of providing noise abatement measures as part of the highway project based on consideration of need, expected long term benefits to the public interest, and the difficulty and increased cost of later incorporating abatement measures into either the highway or the development.

12. FEDERAL PARTICIPATION

- a. General. Federal funds may be used for noise abatement measures in those situations where:
- (1) a traffic noise impact has been identified,
 - (2) the noise abatement measures will reduce the noise impact, and
 - (3) the overall noise abatement benefits are determined to outweigh the overall adverse social, economic, and environmental effects of the noise abatement measures.
- b. Type IA and IB Projects. The following noise abatement measures may be incorporated in Type IA and IB projects to reduce highway-generated noise impacts and the costs of such measures may be included in Federal-aid participating project costs:
- (1) traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations),

- (2) alterations of horizontal and vertical alignments,
- (3) acquisition of property rights (either in fee or lesser interest) for installation or construction of noise abatement barriers or devices,
- (4) installation or construction of noise barriers or devices (including landscaping for esthetic purposes) whether within or outside the highway right-of-way, and
- (5) acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise and for other noise abatement purposes. Acquisition of a few improved parcels may be included in such buffer zone acquisitions to provide a uniform treatment. In authorizing any buffer zone acquisition, consideration shall be given to the needs and desires of the community, the demonstrated efforts of the community to implement effective land use control for compatibility, and the overall public interest. It is preferred that buffer zone acquisition be performed in conjunction with local zoning, land use controls, or other local government controls imposed or exercised in accordance with a comprehensive plan. Buffer zones shall be obtained by acquisition of the least real property interest practicable that is sufficient to prevent incompatible uses of adversely impacted lands while permitting uses compatible with the highway environment (e.g., negative easements that restrict grantors' use). In certain cases it may be necessary to acquire additional right-of-way in fee simple with the intent to dispose of excess interests in a manner compatible with the highway environment. Proposals of this kind shall be submitted to FHWA for prior approval. Any conveyance of excess right-of-way shall be in accordance with paragraph 7c of FHPM 7-4-2.

c. Type II Projects

- (1) The Federal share for noise abatement measures on Type II projects shall be the same as that for the Federal-aid system on which the project is located. For Type II projects on the

Interstate System (including completed sections), the Federal share shall be from Federal-aid Interstate funds.

- (2) For Type II projects, noise abatement measures will not normally be approved for those activities and land uses which come into existence after the effective date of this directive. However, noise abatement measures may be employed to protect activities and land uses which come into existence after the effective date provided local authorities have taken measures to exercise land use control over the remaining undeveloped lands adjacent to highways in the local jurisdiction to prevent further development of incompatible activities.
- (3) The following noise abatement measures may be incorporated in Type II projects to reduce highway-generated noise impacts and the costs of such measures may be included in Federal-aid participating project costs:
 - (a) acquisition of property rights (either in fee or lesser interest) for installation or construction of noise abatement barriers or devices,
 - (b) installation or construction of noise barriers or devices (including landscaping for esthetic purposes) whether within or outside the highway right-of-way, and
 - (c) traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time use restrictions for certain vehicle types, modified speed limits, exclusive land designations, traffic control devices, or combinations of such measures).
- d. Noise Insulation. In some specific cases, there may be compelling reasons to consider measures to noise insulate structures. Situations of this kind may be considered on a case-by-case basis for Type IA, IB, and II projects when they involve such public use or nonprofit institutional structures as schools, churches, libraries, hospitals, and auditoriums. Proposals of this type, together with the State's recommendation, shall be submitted to FHWA for prior approval action.

e. Other Abatement Measures. There may be situations where:

- (1) especially severe traffic noise impacts exist or are expected, and
- (2) the abatement measures listed above are physically infeasible or economically unreasonable.

In these instances, noise abatement measures other than those listed in paragraph 12b-d may be proposed for Types IA, IB, and II projects by the State highway agency and approved by the Regional Federal Highway Administrator on a case-by-case basis when the conditions of paragraph 12a have been met.

13. CONSTRUCTION NOISE

The following general steps are to be performed for all Type IA, IB, and II projects after the effective date of this directive.

- a. Identify land uses or activities which may be affected by noise from construction of the highway. The identification is to be performed during the project development studies.
- b. Determine the measures which are needed in the contract plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic and environmental effects of the abatement measures.
- c. Incorporate the needed abatement measures in the contract plans and specifications.

14. TRAFFIC NOISE LEVEL PREDICTION METHODS

- a. Predicted noise levels to be used in assessing noise impacts shall be obtained from a prediction method approved by FHWA.
- b. The prediction method and the noise level predictions shall account for variations in:
 - (1) traffic characteristics (volume, speed, and truck traffic),
 - (2) topography (vegetation, barriers, height, and distance), and

- (3) roadway characteristics (configuration and grades).
- c. The noise prediction method contained in National Cooperative Highway Research Program (NCHRP) Report 117 as modified in NCHRP Report 144; the Barrier Nomograph (form FHWA 1443); and the method contained in Department of Transportation, Transportation Systems Center Report DOT-TSC-FHWA-72-1 are approved for use. Other noise prediction methods or variations of the above, together with supporting and validation information, shall be furnished to the FHWA Office of Environmental Policy for approval prior to their use.
- d. In predicting noise levels and assessing noise impacts the following traffic characteristics shall be used:
 - (1) Automotive volume - the future volume (reduced for truck traffic) obtained from the lesser of the design hourly volume or the maximum volume which can be handled under traffic level of service C conditions. For automobiles, level of service C is considered to be the combination of speed and volume which creates the worst noise conditions. The average hourly volume for the highest 3 hours on an average day for the design year may be used for those highway sections where the design hourly volume or the level of service C condition is not anticipated to occur on a regular basis during the design year.
 - (2) Speed - the operating speed which corresponds with the design year traffic volume selected in paragraph 14d(1) and the truck traffic predicted from paragraph 14d(3). The operating speed must be consistent with the volume used.
 - (3) Truck volume - the design hourly truck volume shall be used for those cases where either the design hourly volume or level of service C was used for the automobile volume. Where the average hourly volume for the highest 3 hours on an average day was used for automobile traffic, comparable truck volumes should be used.
- e. As an alternative to paragraph 14d, the highway agency may select traffic characteristics to correspond with the critical times of day and night

which will create the most adverse traffic noise impacts upon the nearby activities and land uses. When such alternative traffic characteristics are used, a thorough discussion of such alternative characteristics shall be included in the noise study report.

MINISTÈRE DES TRANSPORTS



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